POPULAR SCIENCE

June 1950 25¢ Monthly

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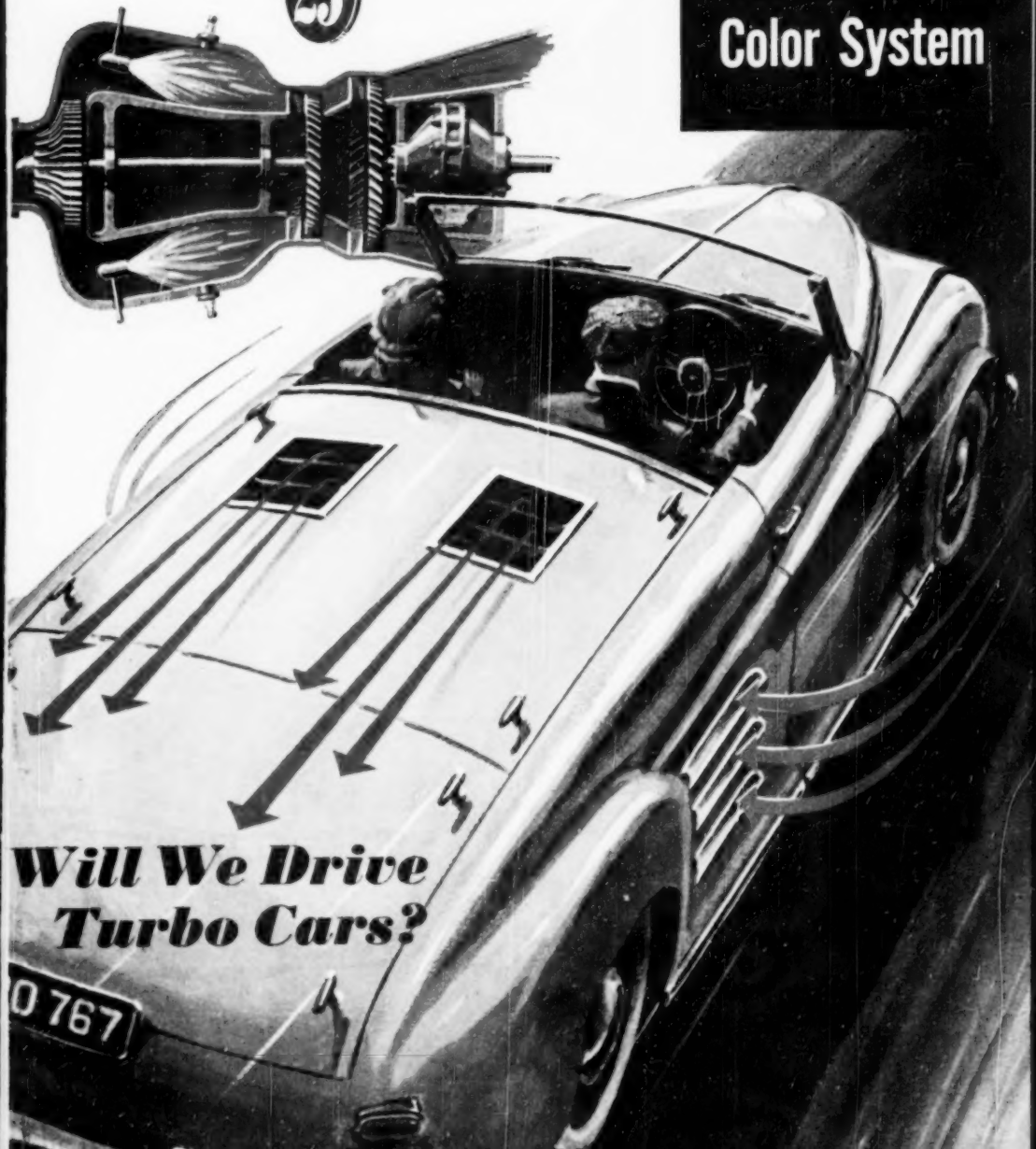

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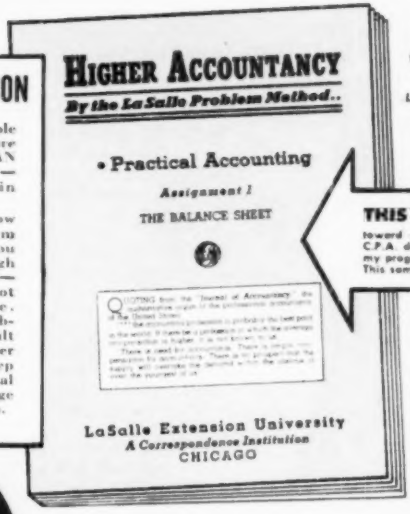

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Letters

First Mechanical Dishwasher?

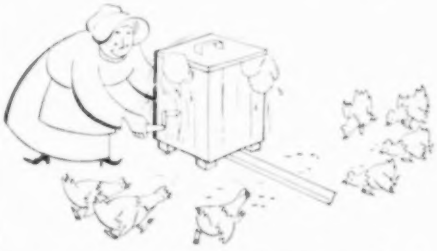
Sir:

The interesting article on Mr. La Raus's simplified dish-washing machine in your January issue [p. 116] prompts me to raise the question: Are mechanical dishwashers new?

In the early '90s while visiting an old farmhouse about half way between New Haven and Hartford, Conn., I had the doubtful pleasure of operating what, I am convinced, was one of the earliest—if not the first—mechanical dishwasher in the U.S.A. The owner of the farm, who was then about 80 years old, told me the dishwasher had been in use there as long as she could remember.

The washer was a square wooden tub, at the bottom of which was a paddle wheel connected through a train of gears to a hand crank. Soiled dishes were stacked on a rack inside, a solution of soft soap and three or four gallons of boiling water was poured over them, and the cover was tightly fastened.

As the operator turned the crank, about 60 times the paddles splashed soapy water



over the dishes. The plug was then pulled, allowing the water to run into a trough that drained into the farmyard—where chickens feasted on the food scraps from the dishes. A second filling of hot water, without soap, rinsed the dishes.

C. M. Huntley

Seattle, Wash.

What's a Screwdriver For?

Sir:

I disagree with your advice to a reader in

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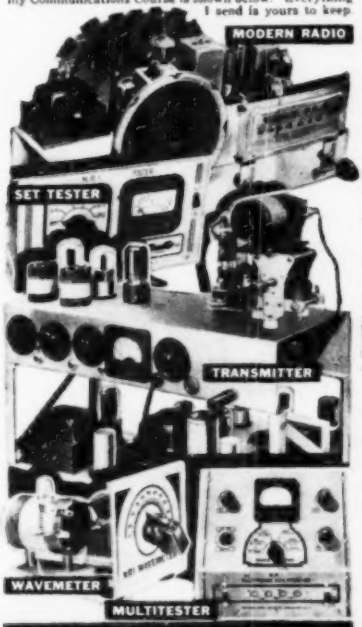

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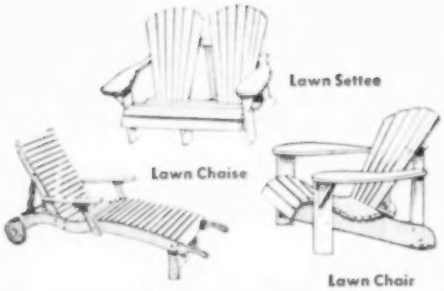

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your March issue, page 20, where you say that prying open a drill chuck is not a legitimate job for a screwdriver.

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HARRY S. DAVIS

Nelsonville, O.

Shocking Suggestion?

Sir:

Some time back you showed how to make an unbreakable lamp pull with a wire banjo string and a shower-curtain ring [PS, Dec. '49, p. 155]. It seems to me that hooking a wire to an electric fixture is a sure way to get a shock.

MERLE HARTZ

Pleasantville, Ia.

A wire pull is no more dangerous than the standard beaded metal chain. In kitchen or bathroom, where the floor might be damp, insert an insulating link in either pull. It is also advisable to use a porcelain, rather than metal, socket and base.

The Great Conduit Mystery

Sir:

"The Height of Ingenuity" in your December issue, p. 214, set me wondering what kind of conduit they use in Chile. Writing from there, Mr. Federico Strasser tells how he located the end of a conduit inside a wall by feeding a small bar magnet into it, on the end of a copper wire, and then locating the magnet by moving a compass over the outside of the wall.

Have you ever tried to feed a bar magnet into a conduit? All the conduit I know of is either steel or iron; and any magnet stuck into it will immediately adhere to the wall of the conduit.

But supposing that, by sheer force, the magnet could be persuaded to reach the end of the conduit. Then would not the conduit itself prove a magnetic shield between the magnet and the compass needle?

In conclusion: Why use a magnet at all?

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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A compass needle, even though minute in power, is sensitive enough to point itself at any hidden conduit or even BX.

Is Mr. Strasser pulling your leg; or do they use very, very expensive non-magnetic conduit in Chile?

FRANK S. HALL

Terryville, Conn.

We'll let our Chilean correspondent, Mr. Strasser, answer for himself:

Mr. Hall's objections are perfectly legitimate—theoretically. But there are some "buts." Allow me, however, to tell you, first, what happened to my mother.

After her marriage, she wrote to *her* mother, telling her what a splendid provider her husband was: even for kitchen work, she reported, she wore silk dresses he had given her. To which my poor grandmother answered by lamenting that her son-in-law must be very poor if he was not able even to afford a cotton dress for his wife to wear while cooking.

The same thing happens in this country. We are very poor—in dollars and foreign currencies—and haven't got money to buy iron or steel for our conduit. But this country is one of the greatest producers of copper. Consequently, we try to employ that metal for all possible purposes. (During the last war we even made nails of copper.) And so in my house, recently built, all conduit is made from copper tubing. It gives me no trouble at all.

FEDERICO STRASSER

Santiago, Chile

Man Needs Rain Quick

Sir:

As a wheat farmer in this southwestern corner of Kansas, which is experiencing the driest weather on record, I read with extreme interest the article in your April issue entitled "Can We Make It Rain?"

With our once-promising wheat crop about dead, I am getting darn tired of gazing at heavily moisture-laden clouds that do not give us the needed rain. So I intend to try to make it rain in this locality.

I would, therefore, greatly appreciate your sending me sufficient information to enable me to construct a silver-iodide generator exactly like the one used by Project Cirrus in New Mexico.

HARRY B. TILLER

Satanta, Kansas

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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Project Cirrus makes silver-iodide smoke with a specially designed blowtorch having a valve that squirts silver-iodide solution into the flame. There are other ways, too—charcoal, soaked in a solution of silver iodide in acetone and then burned, works quite well. However, amateur seeding operations don't often make rain, mainly because only an expert knows just when and how to do the job. Amateur seeding may also disrupt controlled scientific tests of this technique, since wind can carry the silver-iodide particles many hundreds of miles.

Utility vs. Eye Appeal

Sir:

It seems to me that the car designers have lost track of the prime function of an automobile—to provide a means of transportation. It's all right, I suppose, for the Paris dress salons to turn out merchandise with no other thought than eye appeal; but the cars now offered are loaded with supposed eye appeal at the expense of utility.

My first car, purchased in 1907, may have lacked some things now considered indispensable, but a mechanic could get at the works to fix them. If there had been any doors, they would have been designed solely as a means for getting into and out of the horseless carriage, instead of having to be a part of "flow lines".

It's time, I say, to call a halt to the senseless competition for spectacular lines and go back to planning cars for us common people who want to get places at a minimum of expense and a maximum of convenience.

W. P. Shepherd
Claremont, Calif.

Wanted: Old PSes

Sir:

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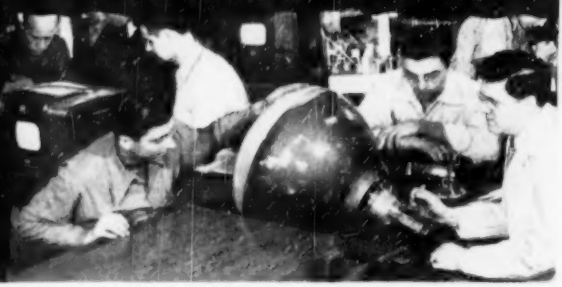
(Right — Instructor explaining operation of 20-inch Cathode Ray tube used in Dumont Television Set.)



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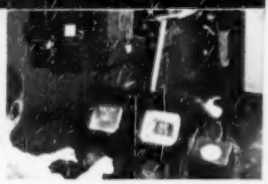

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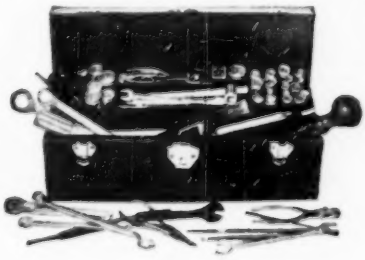

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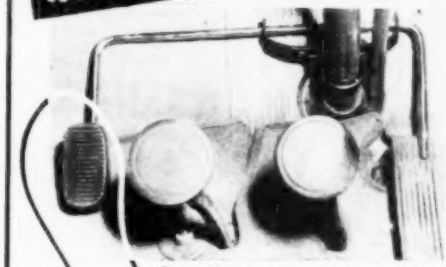

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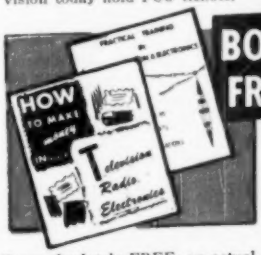

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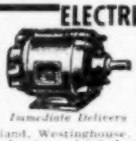

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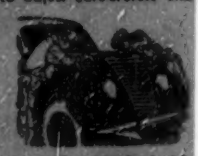

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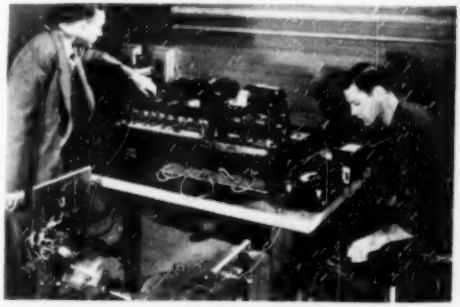

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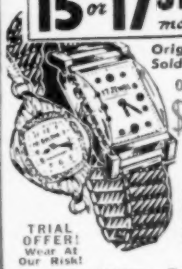

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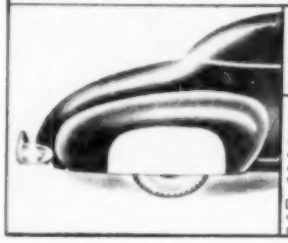

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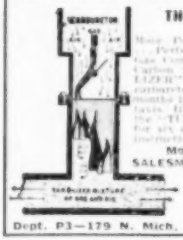

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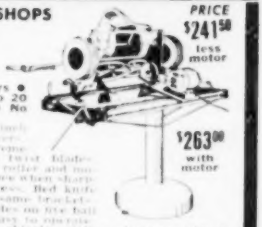

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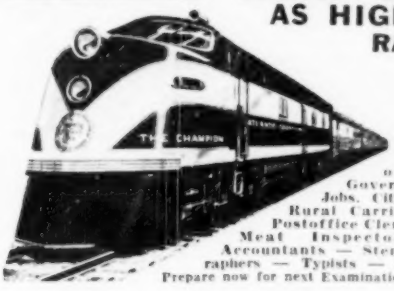

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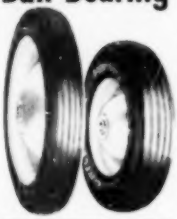

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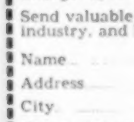

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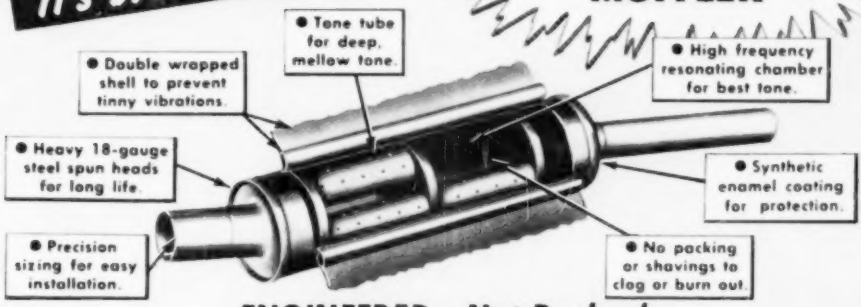

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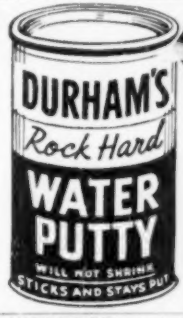

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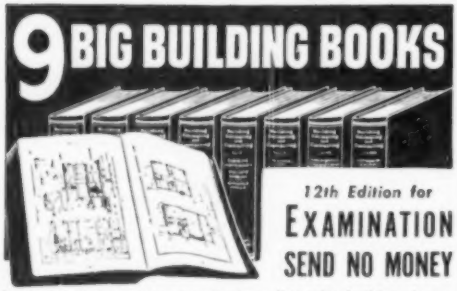

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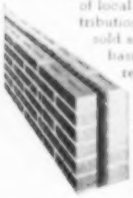

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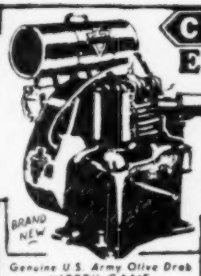

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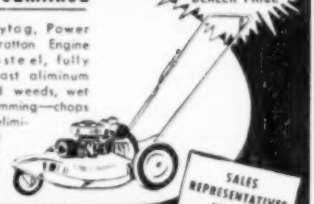

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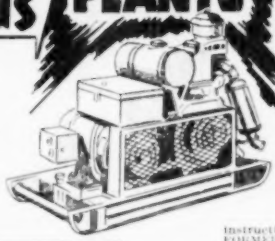

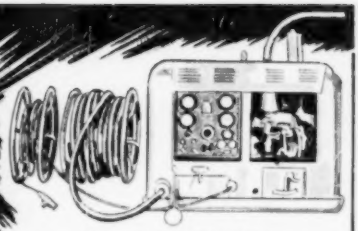

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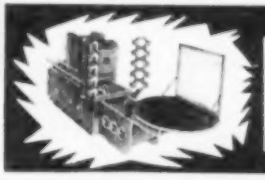

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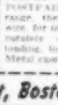

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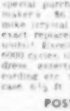

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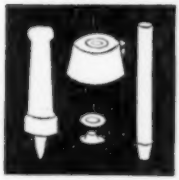

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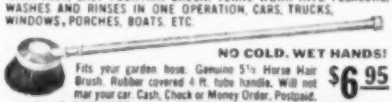

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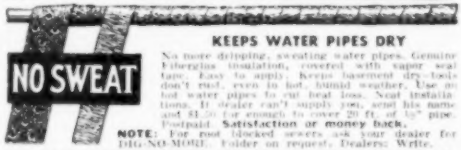

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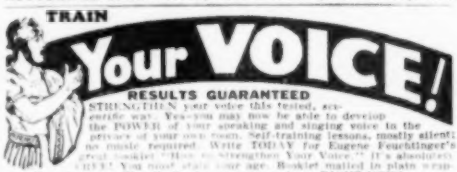

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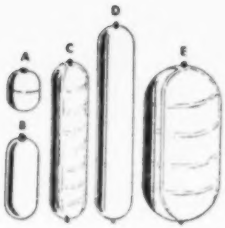

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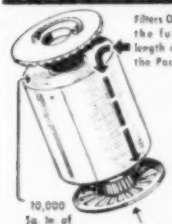

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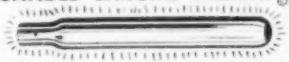

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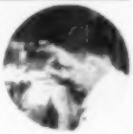

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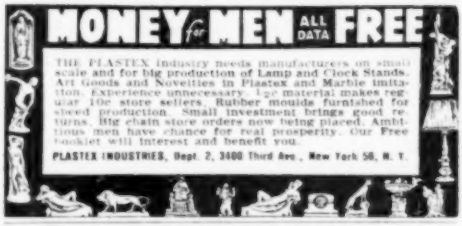

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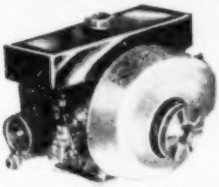

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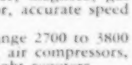

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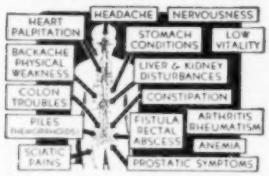

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NOW! New exclusive Hollywood model movies. Available only from Camera Corner. "Home Girl." "Beauty Preferred." "Charming Evefull." each 8mm. $2.75, 16mm $6.00. "Movie Preview No. 9" now ready. Send 50c for this projection-length sample short of other model movies, plus two-color brochure of exclusive subjects. (Former "Previews" 1 to 8 still available at 50c each). Specify 8mm or 16mm. Sample strip and brochure, 10c. Film strip viewer, $1.00. Camera Corner, 391 Bridge Street, Room 130, Brooklyn 1, New York.

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SONG Poems set to music. Send your poem for our proposition and useful Rhyming Dictionary. Richard Brothers, 46 Woods Building, Chicago.

POEMS wanted for musical setting. Send poems for free examination. Five Star Music Masters, Beacon Bldg., Boston, Massachusetts.

BEST Deal! Lyric & Songwriters; Free Lyrics! Topical Emprise Corporation, 1527 Highland, Box 42 SP, Louisville 4, Ky.

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SALESMEN—Make $2500 next 7 weeks. New sensational deal every merchant wants. Beautiful sales kit free. States Trading, 330-C So. Wells, Chicago 6.

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IF You Sell, you need Opportunity Magazine—the "Salesman's Bible," packed with down-to-earth ideas that boost your earnings; filled with hundreds of announcements of new, fast selling items and lines. Send your name and tell us what you're selling now for Free copy of latest issue. No obligation. Opportunity, 28 E. Jackson, Dept. 31, Chicago 4, Ill.

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BE Renewal Headquarters for all magazines. Handle everything at home. Big profits. No experience—no capital needed. Free catalog tells how. Write McGregor Magazine Agency, Dept. 510A, Mount Morris, Illinois.

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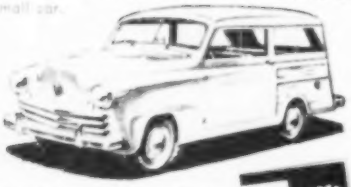

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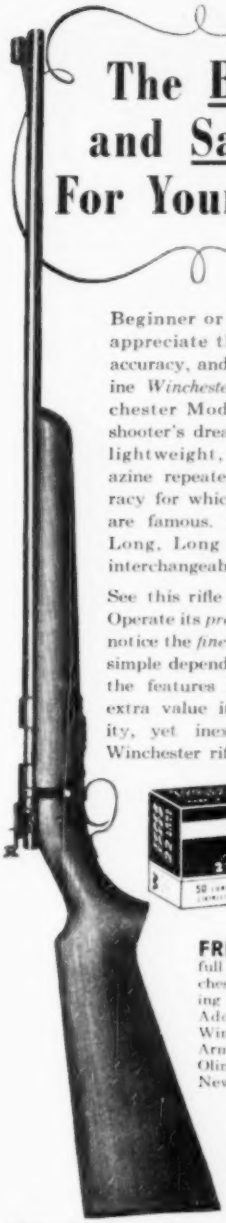

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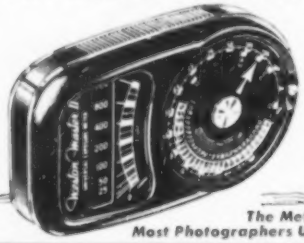

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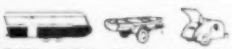

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DEALERS: Valuable franchises are now available for the full line of famous Big Twins and the 125 Models. This is your opportunity to line up with the greatest name in motorcycles. Write or wire for complete information today.

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Sparton Tornado All-Electric Air Horns

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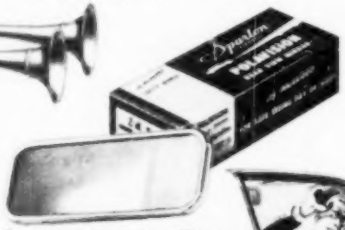
EXTRA-POWERFUL, extra-clear *twin trumpet!* In gleaming, streamlined, chrome-plated design, for outside mounting. Connects with electrical system. No motor tapping. Costs less than many single-trumpet horns. Skippers' pride on boats, too . . . carries miles over water.



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SAVE YOUR EYES, perhaps your life. Sparton patented polarized rear-view mirror cuts blinding, reflected glare by 80%, lets you drive in ease. No finger flicking or adjusting. No other mirror like it. Available for trucks, buses: rubber-rim, rectangular Polavision mirrors.

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New type left and right flasher. Shell and rim bonderized. Rustproof, dustproof, shakeproof. Visible 1500-1800 feet in daylight.

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New flasher type. Special signal lenses. Patented angular widespread visibility. 1000-foot daylight visibility. Over-all dia., 4".

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Trim, shallow design for new lines. Chrome-plated, with brass doors and housing. Sharp, penetrating horizontal beams. Models adaptable for splash pan or body mounting. Sealed beam amber or white lens.

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No experience required. Simple directions teach you quickly. Work at home or travel. Make expenses plus extra profits. Pictures cost you only 2¢. Sell for 15c to 25c. Folks just grab for 'em. They are amazed to see their own photos come to life in broad daylight. Photomaster "shoots" any subject — individuals or groups — buildings and scenes. This new and fascinating business offers unheard-of money-making opportunities everywhere — every day throughout the year.

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You say you want more for your money...

Marlin 80th ANNIVERSARY 1870—1950

See these great .22 repeaters by

Marlin

Look at these big-value beauties! Each is a marvel of modern production methods. Each is traditionally sturdy, safe and dependable. Man-size, handsome firearms—pretested for performance at the factory—these Marlin Rifles give you years of sport and utility at nominal cost. See them today!

81-C packs a load for all-day hunting

18-25 shot tubular magazine repeater. Shoots .22 short or long rifle—regular and high speed. Crisp trigger action—self-cocking—side ejection—positive safety—Seasoned Walnut stock. Rocky Mt. rear sight—Bead front sight. Also available with hooded ramp front sight, peep sight, swivels; at slightly higher cost. A honey for hunting and all around sport! $27.15*

88-C, America's sensational new 15-shot automatic

Smooth, rapid, automatic action; independent safety. Lightning-fast firing of .22 long rifle ammunition, regular and high speed. Positive safety—loads through end of buttstock. Foolproof. Hooded ramp front sight, Rocky Mt. rear sight. Seasoned Walnut Stock. $29.95*

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*Prices slightly higher west of the Rockies and in Canada

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YOURS on request, full specifications on all Marlin Guns, with photo-illustrations, in new 80th Anniversary Catalog.* Enclose 5¢ stamp for postage and handling. Mail coupon to Marlin, Dept. 69, New Haven, Conn.

*Sample pack of Marlin Blades included with our compliments.

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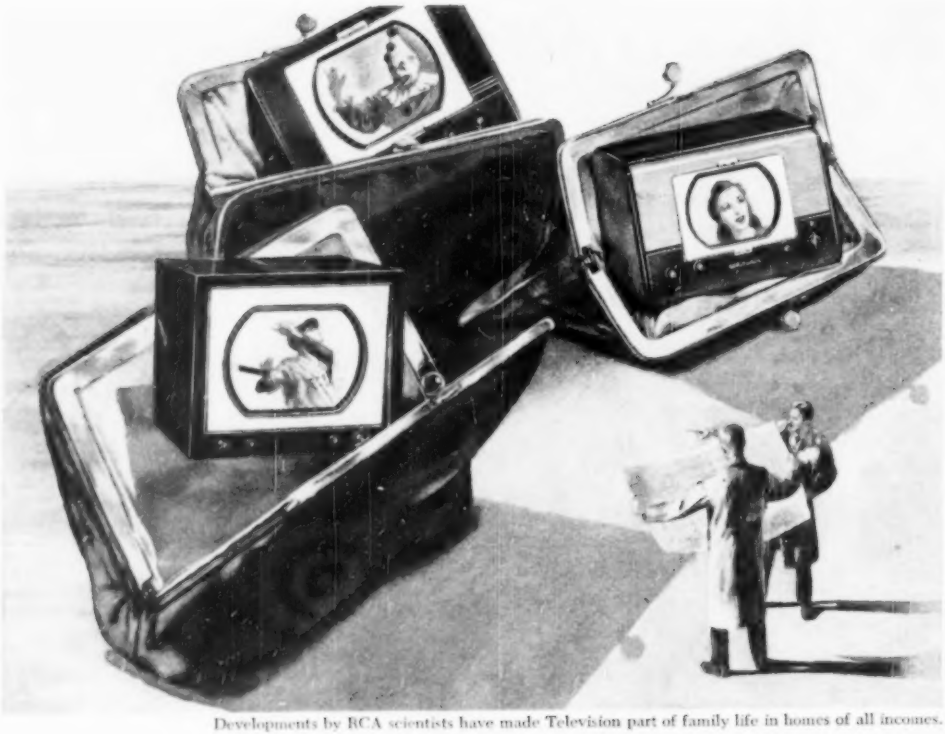


Developments by RCA scientists have made Television part of family life in homes of all incomes.

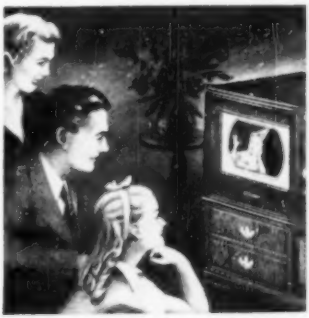
How research fits television into ***more purses***

Remember when television was "just around the corner," and guesses at receiver cost ranged to thousands of dollars? Came *reality*, and pessimists were wrong. Home television sets were reasonable, have grown more so year by year.

One factor has been research at RCA Laboratories. In 1949, RCA scientists perfected the glass-and-metal picture tube—so adaptable to mass production that savings of 30% in tube cost were made. Again, these scientists and development engineers learned how to replace complex parts with less costly, and more efficient materials. A third contribution was the use of versatile *multiple-purpose* tubes—so that one could do the work of several!

Most important, the savings effected by RCA scientists have been quickly passed on to you, the consumer. RCA Laboratories is a great center of radio, television, and electronic research. It is indeed an institution which fits RCA products into more purses!

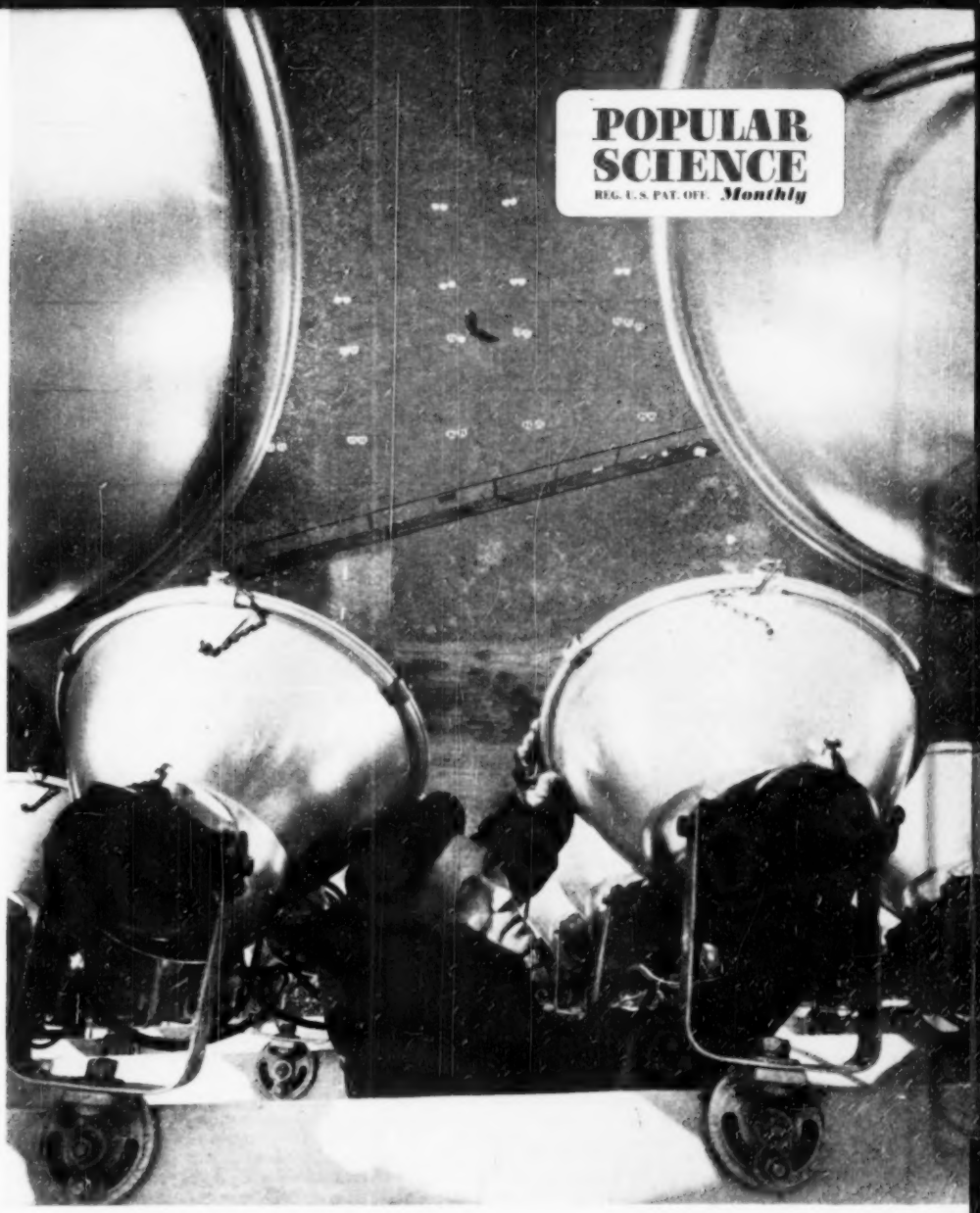
See the latest in radio, television, and electronics at RCA Exhibition Hall, 36 West 49th Street, N. Y. Admission is free. Radio Corporation of America, RCA Building, Radio City, N. Y.



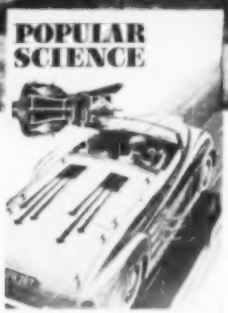
New RCA Victor 16-inch home television receiver, a leader in the 1950 line.

RADIO CORPORATION of AMERICA

World Leader in Radio — First in Television



Aiming Baseball Lights . . . At Cleveland's Municipal Stadium, where the Indians will play 24 night baseball games this season, a new lighting system virtually doubles former illumination. How Westinghouse engineers adjusted its 1,318 floodlights for maximum effectiveness is shown above. First they laid numbered disks on the field, at precalculated positions. Each disk served as a target for a 1,500-watt light, such as the engineer is seen aiming. Clustered in twos and threes, targets—these are on the right-field grass—are visible as small white dots.



Cover by Ray Piock

World's first gas-turbine car achieved 90 m.p.h. on test track.

Will We Drive

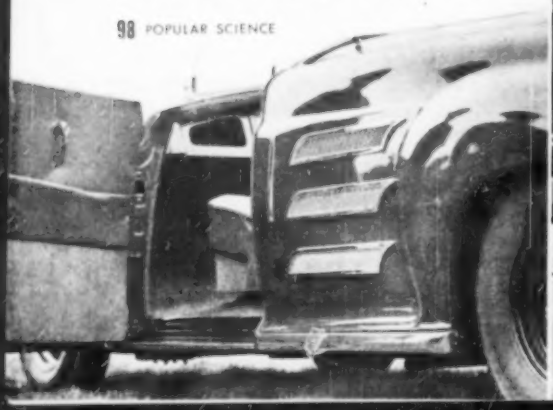
Can the aircraft wonder engine earn a place on the highway? Both U. S. and British engineers think so.

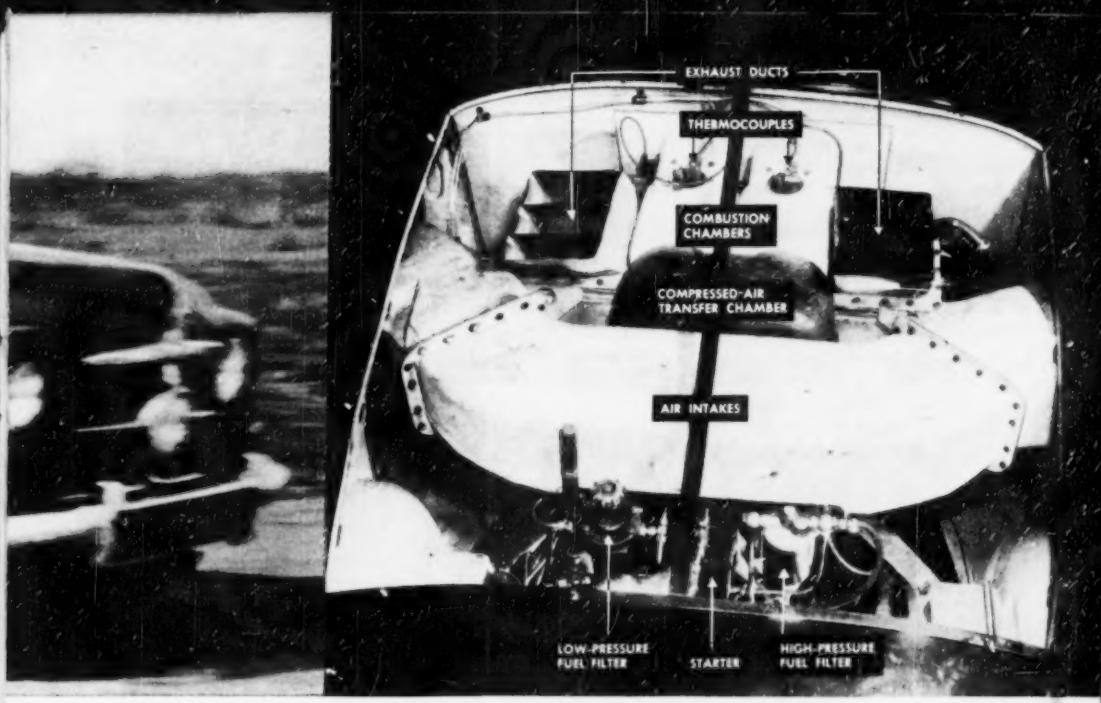
LONDON, ENGLAND

NORTH of London, the other day, they tested out a brand new kind of automobile. It had no pistons and no cylinders. It had no carburetor. It had no crankshaft.

Air intakes handle ten times amount of air required by piston engine of comparable power. Compressor rams this into combustion chambers at pressure of about 45 lb. per square inch.

Exhaust issues at 100 m.p.h. It has no jet effect on propulsion. Windshield in top photo is replaced here with small windscreens. This photo and one at left are from *Mechanics*, London.





Rover engine is 3 feet long, 18 in. wide, and 20 in. high. Turbine wheels have 5-in. diameter.

Turbo Cars?

By Devon Francis

It had no clutch pedal, distributor, valves, radiator, or transmission. It had none of those conventional pulsing exhaust noises.

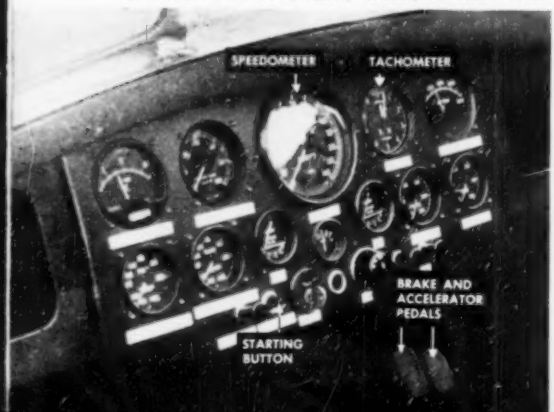
But it had performance.

It accelerated from a standing start to 60 miles an hour in 14 seconds. It streaked up to 90 miles an hour with no apparent effort, and easily could have bettered 100. If it tended to "creep" at a standstill, a light pressure on the brake pedal would hold it stationary. The car had practically no vibration, moving or standing still.

Outwardly, it looked like a standard British-produced open car with the rear seat blocked off to accommodate an extra-long turtleback. It *did* smell of kerosene—that lowly product of crude oil—and that was the tip-off.

By coincidence, at the same hour, almost 6,000 miles away in Seattle, Wash., a 10-ton truck was cruising the highways under the thrust of a kind of engine that was brand new to truck wranglers. The weight of the engine was less than a twelfth of that of a Diesel of comparable power. It occupied less than a tenth of the space that would

Instruments on dash are largely for testing. Dials on production model would report compressor and oil pressures, compressor speed. Controls are accelerator, brake, reverse lever.



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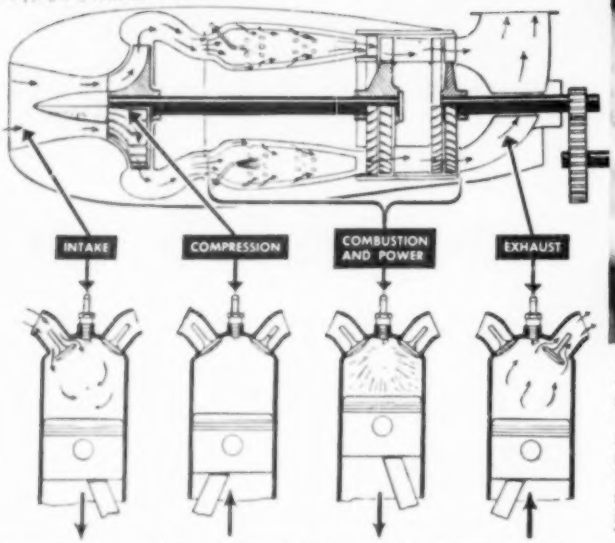


Gas turbine can be compared this way with piston engine.

Sixty of these tiny blades are on perimeter of both compressor and power turbines of Rover engine. Made of "Nimonic" nickel alloy steel, they must withstand constant gas blast of 1,500° F. Due to high speed, balance is big problem in turbines. Engine idles at 7,000 r.p.m., turns at 36,000 at car speed of 90 m.p.h.

have been taken up by a Diesel or gasoline engine and its accessories. It had only a tenth as many parts.

The truck, too, had a faint kerosene odor.

For the British automobile and the American truck had this in common: they were the world's first highway vehicles powered by gas turbines. They had engines that were close relatives of the engines that drive today's ultrafast fighter planes, some of the newest bombers, and that spectacular new British airliner, the Comet (PS, May '50, p. 98).

Contrary to newspaper accounts, this new automobile and new truck were *not* jet-propelled. They were not moved by a hot tailpipe blast. Instead, their turbines produced shaft power to drive the rear wheels.

Their turbines at full power whirred at an incredible speed for heat engines—from 36,000 to 40,000 revolutions a minute. In fact, that was three or four times as fast as current aircraft turbines.

The car and the truck represent the first basic change in automotive power plants since the invention of the internal combus-

Boeing compressor, shown below with one of two turbines in engine, pumps air to combustion chambers at three times atmospheric pressure. Engine has diameter of 22 in. and is 42 in. long.

Cutaway of Boeing engine shows compactness. It has an electric starter, 2 igniter glow plugs. Fuel system consists of pump, governor, spray nozzles. Top fuel pressure is 400 lbs. per sq. in.

tion engine in the 19th Century. The car was designed and built by the Rover Company, Ltd., of Birmingham, England, as a "test bed" for road turbines (PS, Sept. '48, p. 138). The truck was powered by an engine designed and built experimentally by the Boeing Airplane Co., of Seattle, maker of the Stratojet, the world's fastest bomber.

The car and truck may bring a complete revolution in automotive power and design in the next five years—or less.

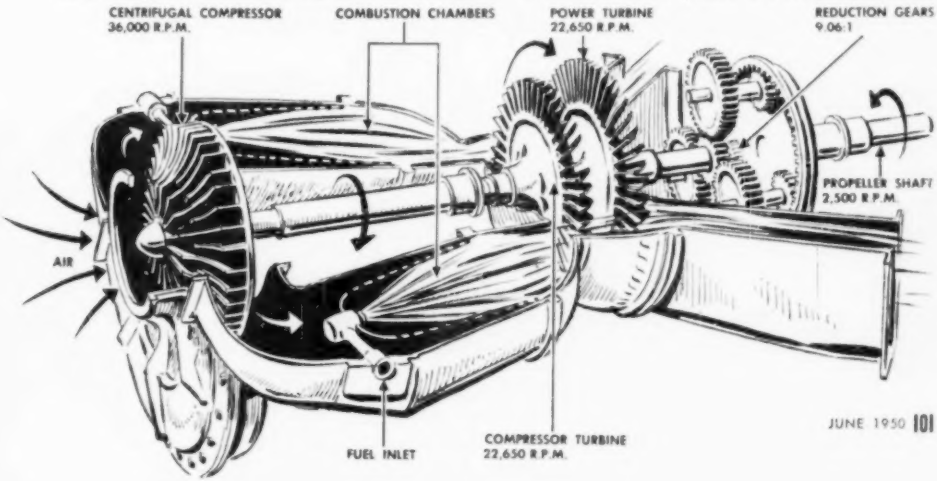
They may. No one knows just yet. There is a score of problems to be solved before the man on Main Street can walk into an automobile showroom and order the turbine job with the chrome exhaust ports. Or the truck fleet owner can buy mechanical horses so compactly packaged that he can tote five to seven tons more cargo without increasing the length of his combo.

But those who have followed the progress of Rover and Boeing during the last couple of years are convinced that the day of turbine propulsion for passenger cars, trucks, and buses is almost a reality.

It wouldn't be surprising. The gas turbine as a replacement for the piston engine in aircraft is just coming into its own. The ▶

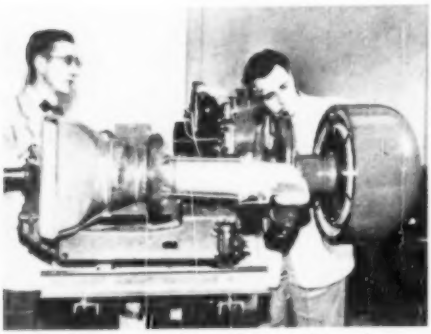
Turbine engine in truck is almost lost in chassis compared with Diesel at right. Vertical stack at far left (arrow) is one of two for exhaust. Truck was made by Kenworth Motor Truck Corp.

Gas- and power-flow drawing of Boeing engine. It delivers shaft power via reduction gears.



gas turbine as a shaft-power unit for propeller-driven aircraft will be flying the oceans as a "turboprop" in a couple of years. Both the steam turbine and the gas turbine have been adapted to railway locomotives. Turbines are an old story to ocean vessels. It's about time that rubber-tired vehicles got a crack at the turbine.

Like any gas turbines, the ones in the Rover and Boeing-powered truck are vastly



Boeing engineers have succeeded in silencing normal whine and roar of gas turbine through big muffler at far right. Turbine has been under development for U. S. Navy Bureau of Ships.

simpler than a piston engine. Substantially, they have only six parts—a compressor, two chambers to burn the fuel, a turbine to drive the compressor, another turbine to develop shaft-power, and two shafts. Three or four main bearings will take all the load of a turbine engine. There are no other bearings in the engine proper. There are no reciprocating parts. No pistons jump up and down. Moving parts rotate like an old-fashioned waterwheel.

The engine has only two "cylinders." In this instance the "cylinders" are a couple of containers where kerosene is burned as simply as in an oil heater. The compressor does the same job as the piston on the compression stroke of a reciprocating engine—it compresses air. Any engine must have a lot of air to burn its fuel, and gas turbines must have an extraordinary amount of air. They are pigs for air.

The *power* turbine is the gimmick, the key to the whole operation. The gases that have driven tornado-like through the compressor turbine attack the power turbine and spin it too. That produces shaft-power. Once you've got shaft power, you can move something. Gear down the Rover and Boeing power-shafts, and you've got torque for the rubber on the road.

It's no more complicated than that. The automotive turbine differs from an aircraft turbine in that it has *two* shafts. An aircraft turbine engine has only one. The reason for that is the same reason that a conventional automobile has a way of disengaging the engine from the rear wheels. If the automotive turbines were permanently geared to the rear wheels, it would stop every time the car stopped. So that second shaft, the power-shaft, is motionless when the car is at rest. Like the propeller shaft in a conventional car, it is in constant gear with the wheels. The shaft on which the compressor and the compressor's turbine turn isn't. It keeps going, whether the car is in motion or not. The *power* shaft delivers power as the driver needs it.

The power turbine revolves at a speed dictated by two conditions: the load on the engine and the amount of energy fed to it by the compressor. The speed of the compressor depends on the amount of fuel fed to the burning chambers. On a hill, the turbine, assailed by an inferno of gases, twists harder. In one sense, when the car hits smooth sailing on a straightaway the turbine becomes a "fluid" coupling between the

Within this quartz jacket, gas-turbine combustion is under study. Boeing engineer observes how and where burning occurs. Research is resulting in lower fuel consumption, higher power.

compressor and the wheels.

All that's on the plus side. So is quick starting, characteristic of the turbine engine. It will roll without a whimper at 65° below zero. It doesn't cough or die under load.

On the plus side too are the absence of a continuously operating ignition system, and the turbine's smaller size. Fitted with tur-

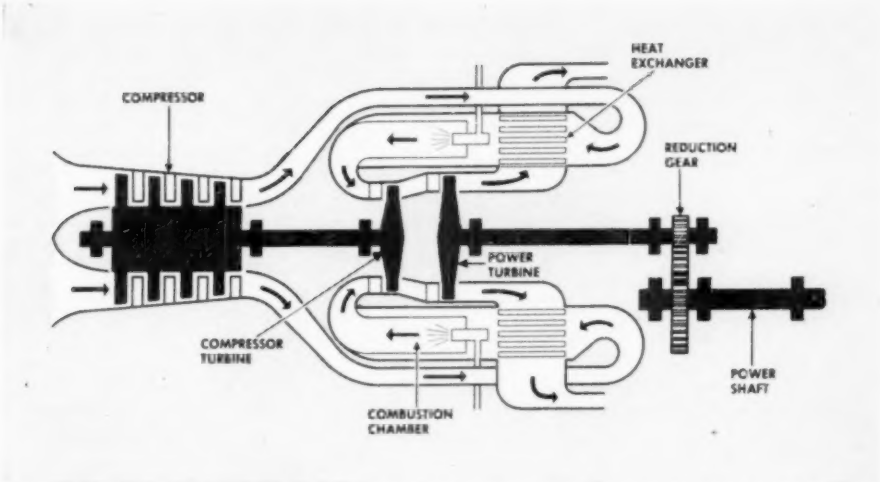


Diagram by R. H. H. Barr, British engineer, indicates how heat exchanger can be adapted to a gas-turbine engine. Power Jets, Ltd., of London, pioneer in gas-turbine research for propulsion of road vehicles, holds copyright on drawing and concept of this type of engine.

bines, today's cars could be lowered several inches. Hoods could be shorter, increasing road visibility. Cars could be aerodynamically cleaner. There is no radiator to propel against the air.

The turbo car (as they are dubbing it here in England) can have a much lighter chassis without sacrifice of strength because the engine is light. That would boost fuel mileage. Moreover, it burns cheap fuel. A turbine will run on almost anything short of firewood. For railway use, they are even experimenting with powdered coal. Boeing proposes using natural gas.

Finally, sheer simplicity should make a turbo car's or turbo truck's maintenance costs considerably below those on a piston vehicle. Removing the Boeing turbine engine, dismantling it, inspecting it, reassembling it, and putting it back in the chassis is a job for one man—in just six hours. He doesn't even need a chain hoist.

Gas turbines supply extra dividends. The turbine-powered passenger car or truck doesn't need a special heater to keep its human cargo warm in frigid weather. Heat can be bled off the compressor at will.

All this sounds too good to be true. There has to be a catch somewhere. Actually, there are a good many of them. The biggest drawback to the gas turbine for road vehicles is that it does its best at near-maximum r.p.m. It falls down in its power delivery at low speeds, or part-load, as the engineers say. And automobiles, trucks, and buses operate a lot more at part-load than they do at full load. The cure for this ailment may be a transmission, the same device that piston engines use to overcome their problem of low torque at low speeds.

Gas turbines are notorious for low fuel mileage. They develop a lot of heat but they waste too much of it. The Rover's engine, rated at 200 brake horsepower, gets around six miles to the gallon of kerosene. Using kerosene, the Boeing turbine, rated at 175 hp., is three and a half times more expensive to run than a Diesel.

There is a reason for that. It goes right back to that voracious appetite of a gas turbine for air. In a piston engine about 4,500° F. is developed in a cylinder head at the instant of fuel explosion, the start of the power stroke. The engine metals can stand this only because the explosions are intermittent. Water jackets, air, and oil keep carrying away the heat.

In a gas turbine there is *continuous* burning of fuel at about 3,500° F. There must be a great extra volume of air to *cool* the gas down to 1,500° before it is fed to the special-alloy turbines, so the metals can take it. That's where the loss occurs—most of the energy developed in burning the fuel to get gas volume and velocity to turn the power turbine is expended in turning the air com-

pressor. The engine produces shaft-power as a sort of afterthought.

The ultimate solution to better efficiency is better metals. The **metallurgists** are working on that one. Gas turbines will have to do a lot better in passenger cars before the crossroads of Great Britain and America grow forests of kerosene pumps. It may be another story on gas-turbine trucks, though. Fuel costs in trucking are the least of the operator's worries.

Preheaters May Help

Heat exchangers, transferring heat from burned gases to incoming air, will help fuel mileage. Preheating the air before it is burned may double the fuel mileage. That merely means better combustion, like getting a better draft in a fireplace.

There are other stoppers for the present. High engine speeds pose problems of exact balance or possible bearing overloads. Then, too, gas turbines don't do as well in summer heat as they do in the winter; the compressor can't bite thin, hot air as well.

For the first two or three seconds, acceleration from a dead stop is poor on the Rover. The engine is sluggish initially because it takes time to get the power turbine up to speed. But once it starts rolling, it goes. The jump from 10,000 r.p.m. to 15,000 takes just three seconds. Boeing smartly put a gearbox in its job. The truck's acceleration leaves nothing to be desired.

Noise in the automotive gas turbine can be another problem. The Rover car hisses and whines. On sudden acceleration it roars. The noise comes from air intakes, compressor vanes, reduction gearing, and exhausts. Filters, insulation, and muffling may reduce the decibel level of turbo cars to that of piston-driven vehicles. Boeing has succeeded in reducing the noise level to *less* than that of piston-driven trucks.

Boeing, too, has whipped the problem of getting engine-assisted braking in going downhill. So far, Rover hasn't.

Says Turbos Are Coming

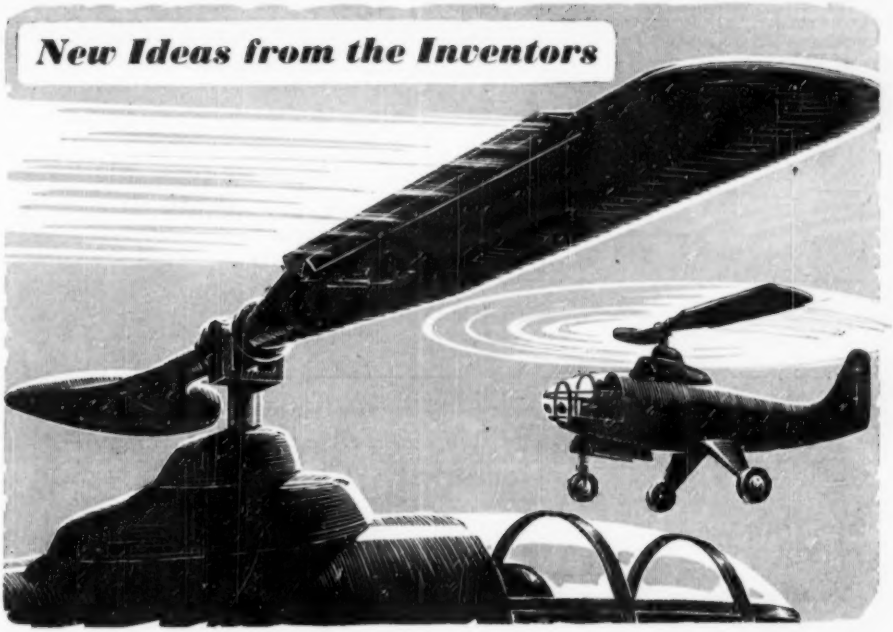
But no less an expert than England's leading lay authority on the gas turbine, G. Geoffrey Smith, editorial director of *Autocar*, and the first man ever to drive a gas-turbine car 90 m.p.h., says, "The Rover in performance already compares favorably with the modern piston-engine automobile—which has 50 years of experience behind it. I don't say the turbo car is here yet as a salable article. But it's coming. It's bound to."

So it may well be that presently you will roll up to a service-station pump and say, "Ten, please—of the lowest octane you've got." END

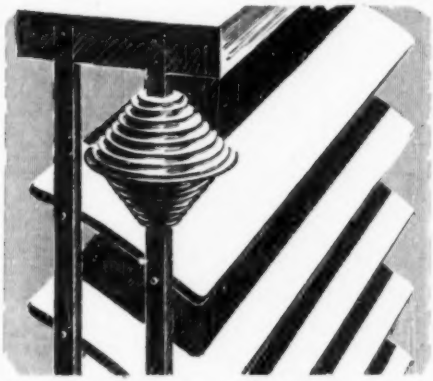
Giant 'Copter to Lift Tank

This is a nonflying early model of the "Flying Crane," one of the world's two largest helicopters. Being developed by the Hughes Aircraft Co., for joint use of the Army and Air Force, the XH-17 would be used to lift and ferry heavy equipment, such as tanks, trucks, and bridge sections, across mountains and other inaccessible terrain. The huge craft is powered by a unique combination of turbojet and ramjet. Two J-35 turbojet engines, mounted on the fuselage, send blasts of compressed air to the tips of the 136-ft. rotor blade. At the tips, the air is mixed with fuel and burned in small ramjet engines, creating a thrust that rotates the blade like a pinwheel.

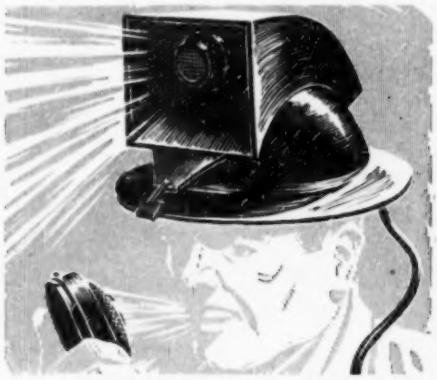
New Ideas from the Inventors



1 One Blade to Lift 'Copter. A jet-propelled blade, driven by compressed gas from a free-piston generator mounted in a housing that serves to counterbalance the blade, powers this helicopter. Because the propulsion unit is confined entirely within the rotor, the problem of reactive torque is eliminated. The generator is similar to that designed for gas-turbine locomotives (PS, Nov. '48, p. 98).

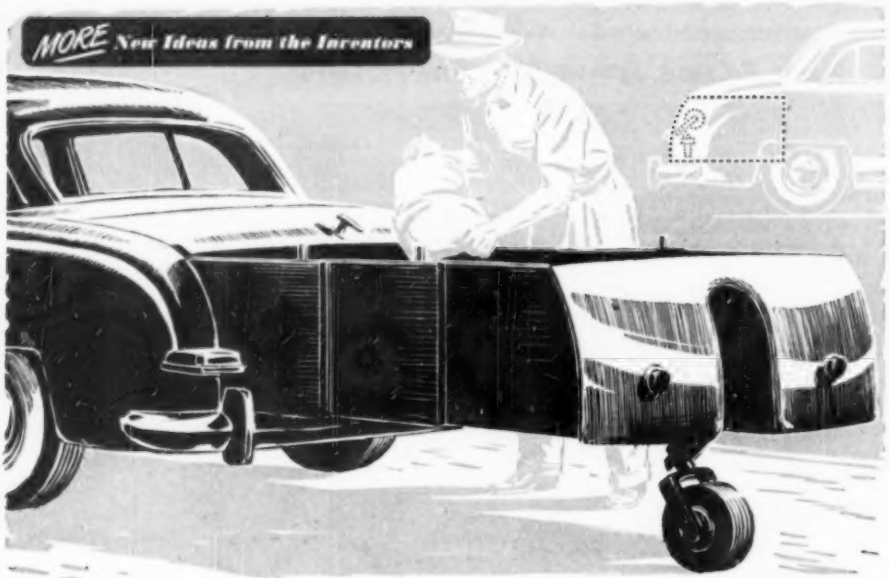


2 Sun to Operate Blinds. Venetian blinds fitted with this thermal control system would open and close automatically according to the heat from the sun's rays. When warmed above a predetermined temperature, the gas-filled control unit expands and closes the blind's pivoted slats. On cooling, it opens them.

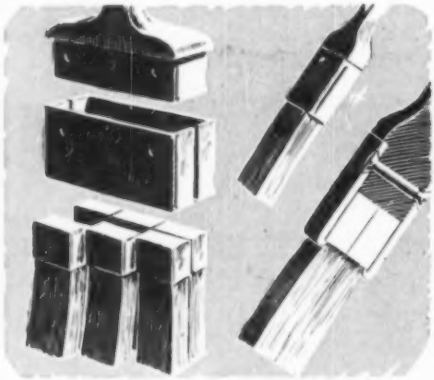


3 Hat to Have P. A. System. Policemen handling traffic jams at ball games and similar gatherings would be able to save their voices with this helmet. It carries its own lightweight loudspeaker powered by a portable amplifier. The microphone can be either the hand-held type or the more compact throat variety.

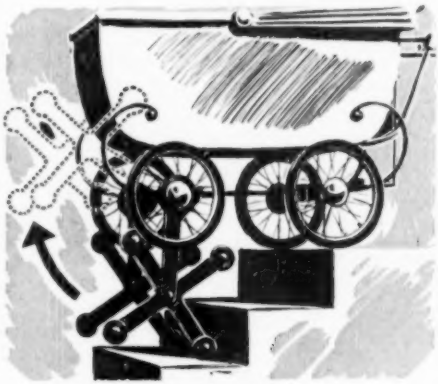
Turn the page, please, for three more new ideas.



4 Trailer to Fit in Car. Designed to fit into the existing luggage space in a car, this trailer would simply be pulled out when needed. Also, since it is constructed to telescope, its capacity could be adjusted, within limits, to fit the size of the load to be moved. The rubber-tired caster wheel, on which the rear of the trailer rides when it is extended, folds up out of the way when the trailer is not being used.



5 Brush to Be Sectional. A paintbrush could be made up to fit the job with these bristle units—one unit for a small brush, two for a medium-sized brush, or six for a large brush. Because the bristle units could be removed from the handle and be completely immersed in solvent, cleaning after use would be simplified.



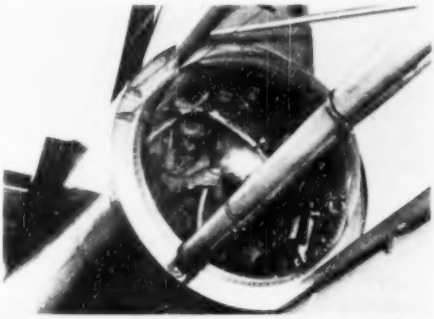
6 Carriage to Climb Stairs. Shown on a baby carriage, this device is designed to make it easy to move any similar wheeled cart or dolly up or down steps. When down in place, four rotating, roller-tipped spokes support the front end on the step below, "walking" up or down to the next step as the cart is moved.

Patents on these inventions have been granted to 4. J. Lee, Farmington, Conn.; 2. J. Grebe, Midland, Mich.; 3. G. Eash, Toledo, Ohio; 4. D. Brand, Johannesburg, South Africa; 5. P. Riechatt, Chicago; 6. A. Pascos, New York City.

Fuel-transfer boom is a rigid, telescopic, hollow shaft. Support structure is hinged to tanker's tail. Black strip visible on inner edge of the U-shaped ruddevator above is the electric de-icer.

De-Icers Protect Refueling Boom

CONTROL surfaces on the Flying Boom, designed for refueling in mid-air, are equipped with novel de-icers, made of rubber in which heated wires are imbedded. The rubber de-icing boots edge the V-shaped controls, called "ruddevators," used by an operator in a tanker plane to "fly" the boom to the plane to be refueled. The photos on this page show details of the boom recently released by Boeing, who developed it to increase the range of warplanes.



Here is a closeup of the boom operator, dubbed "Clancy" by Boeing Airplane Co. test pilots. By manipulating ruddevators, he "flies" boom into position for coupling the tanker and bomber.

View from tanker shows boom being lowered into position for delivering fuel. Operator's station is in same space normally occupied by tail gunner and armament in B-29s used during war.

Contact has been made and fuel is being transferred. Boom connects to bomber's intake line through slip-away doors just back of nose. Tanker flies above and in front of other plane.

You'll Get *Color TV* Sooner than You Think

RCA's new tri-color tube mixes all three colors electronically—without lenses, disks, or mirrors.

By John F. Loosbrock

Drawings by Morris Cohen

THANKS to a new tri-color tube, color TV has moved much closer to your living room. Maybe you'll even find a set under your 1951 Christmas tree. And the pictures will compare in quality with the best you can get on your black and white set, with the dividend of glowing color.

The bottleneck breaker is a new viewing tube, developed by RCA, that puts the colors back together after the color camera has torn them apart. And it does this electronically, without mirrors, lenses, or disks.

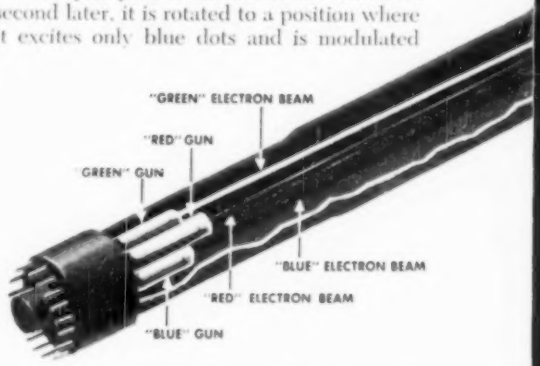
At present, there are two versions of the new tube. One uses three electron guns to paint the colors on the screen. The other uses one. Both employ a viewing screen coated with rows of small, closely spaced phosphor dots. These are arranged in triangular groups of three. Each triangle contains a dot that glows red, when hit by an electron stream, a dot that glows blue, and a dot that glows green. The hand-made models used in recent tests before the Federal Communications Commission in Washington had 351,000 such dots, 117,000 of each color.

The tube that looked best during the tests uses three electron guns mounted in the tube neck—one for each of the three primary TV colors. Between the guns and the screen is a metal mask having 117,000 tiny holes, one for each group of dots.

The three guns are so mounted in relation to the mask that the electron stream from each gun strikes only the dot emitting the particular color that the gun is painting. Thus, the red gun can hit only the red dot, the blue gun the blue dot, and so on.

The second version uses essentially the same principle. The mask and the dot groups are identical. But it works with a single electron gun. Its beam is rotated magnetically so that it occupies, in sequence, the positions of the three guns in the three-gun kinescope.

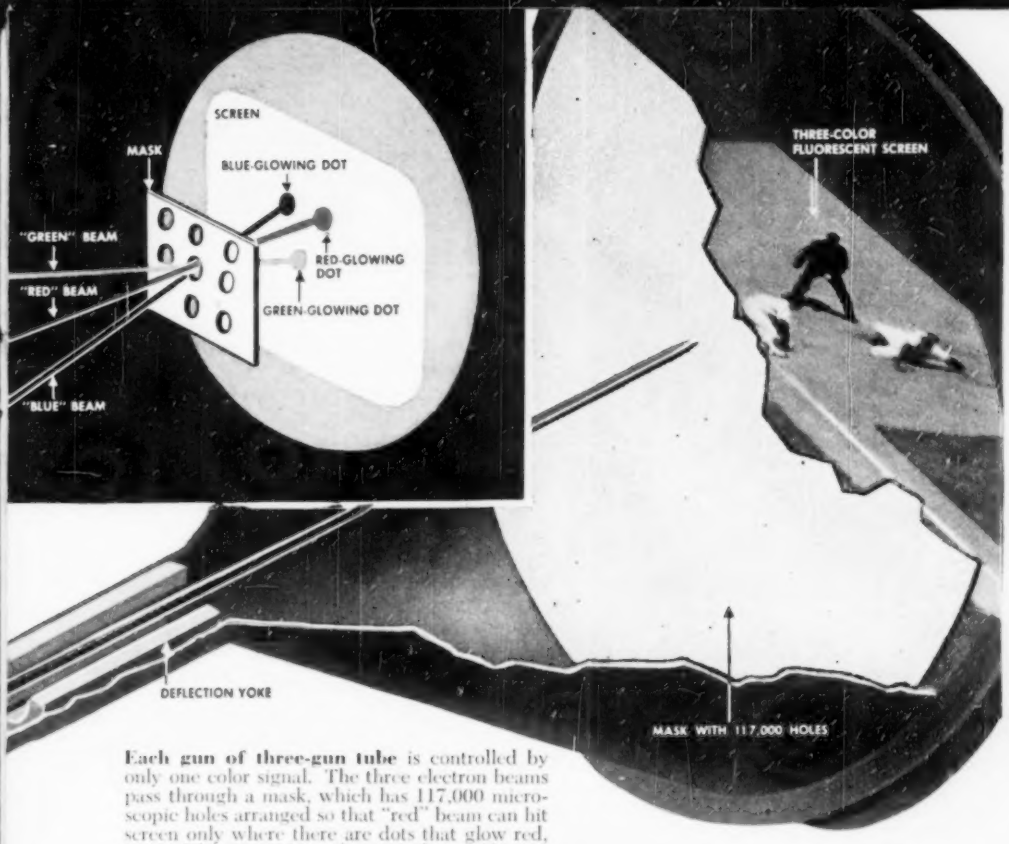
Thus when the beam is in a position corresponding to the red gun of the three-gun tube, it is modulated only by the red component of the video signal, and strikes only the red phosphor dots. A tiny fraction of a second later, it is rotated to a position where it excites only blue dots and is modulated



only by the blue component of the signal. The third position produces green. You see all three at once.

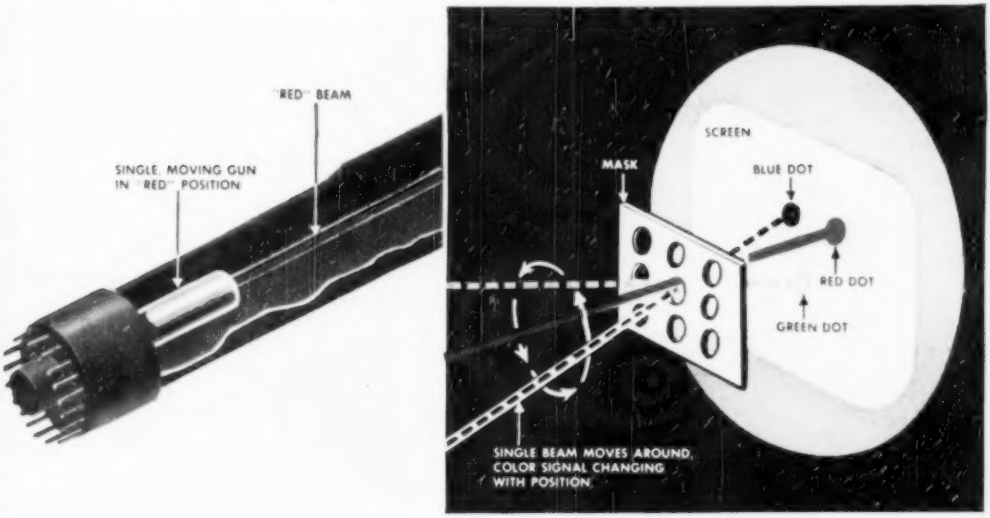
The pictures look good. I saw the new tube demonstrated in Washington. The colors were true and the pictures clear—at least as good as the best black and white picture, and you can't expect to do better with TV confined in its present bands.

Why is the tri-color single tube so important? It's because the most controversial part of the color TV problem to date has been that of putting the colors together for your eyes. As you've probably read, the color question is the nub of a hot controversy that the FCC must settle, one way or another, in the near future. Three warring systems have been beating the drums for their own particular product—RCA,

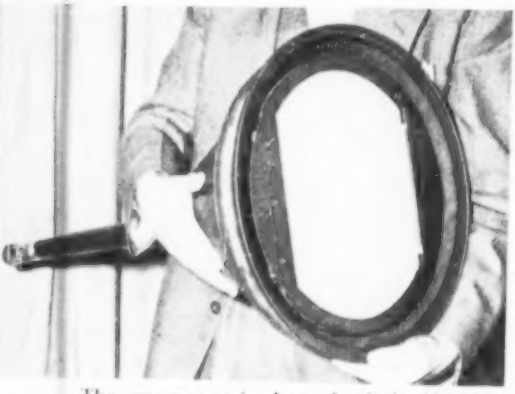


Each gun of three-gun tube is controlled by only one color signal. The three electron beams pass through a mask, which has 117,000 microscopic holes arranged so that "red" beam can hit screen only where there are dots that glow red, "green" beam can hit only green dots, and so on (see inset above). Individual colored dots, too tiny to be picked out by human eye, fuse together like dots in color engraving to give impression of smooth, continuous color picture.

In one-gun tube dots and mask holes are identical with three-gun job. But electron beam is rotated magnetically, changing "color" with position so one gun can do same work as three.

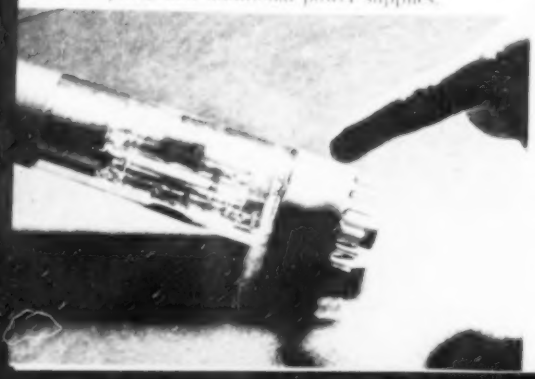


RCA's tri-color camera picks up telecast from station WNBW in Washington during demonstration of new RCA color tubes before the Federal Communications Commission.



The one-gun, tri-color tube looks like this. RCA engineers are working on improved models, with more dots. Tube can be used in some standard receivers, but needs extra circuits.

Close-up shows neck of three-gun tube. It fits into standard RCA receiver, heeled up with 49 more tubes for color synchronization, sampling, and additional power supplies.



Columbia, and Color Television, Inc.

Here's how the three systems differ:

RCA. The camera directs red, blue, and green light from the subject into three different lenses. It does this with "dichroic" mirrors, each of which reflects only one color. Individual scanning tubes translate each image into signals for transmission.

In the receiver, RCA now uses the tri-color tube. In earlier tests it employed three tubes and a mirror system to put the colors back together on a screen.

CBS. The color camera uses a mechanical device—a whirling disk divided into primary-color segments. This rotates behind the camera lens and filters the light so that the colors pass through in succession.

At the receiver CBS puts the images together in black-and-white on a screen. In front of this another color disk, synchronized with the one in the camera, colors the images. Recently, however, CBS demonstrated an all-electronic receiver that eliminates the often-criticized mechanical wheel. It projects a big picture with a lens-and-tube system like CTI's (see below).

CTI. Like RCA it uses three lenses, with a dichroic-mirror setup to separate the colors. But these produce three small, separate images on the scanning tube face. Successive lines of red, blue, and green are then transmitted from the three images.

The CTI receiver uses a single tube, on which the three color images appear, greatly reduced and side by side. Another lens system magnifies and projects them.

One important virtue of the new RCA receiver tube is that it can be used with *any* of the three systems.

It eliminates the registry problem inherent in the projection systems used by RCA and CTI and now adopted by CBS. Or it could replace CBS's receiver disk, with its mechanical, size, and noise problems.

Each system has its own advantages and disadvantages, both in picture quality and in its effect on the some 3,000,000 persons who now own black and white sets. Let's take a critical look at all three, as I did.

CBS leads the parade in color quality, especially in the critical skin tones. Dr. Peter Goldmark of CBS, who started the color whirl back in 1940, says this is due to his "field sequential" system, which shows complete pictures in each color in rapid succession. But to get this, CBS must forego "compatibility." That means you can't watch a CBS color picture even in black

and white on your present set. To squeeze its signal into the six-megacycle band allotted to color TV, CBS had to cut down its picture lines from 525 (the black-and-white standard) to 405.

If you're willing to settle for black-and-white pictures of color programs, you could get a converter for an estimated $15 to $25. Conversion of your set to receive color would run around $75. New color sets would cost somewhat more than present black-and-white prices. CBS claims that its system is the cheapest, and the only one that could begin color broadcasting now.

For RCA, the big advantage claimed is that it's compatible, since it uses a 525-line picture, so that you can see a color broadcast in black and white with your present set. But even with the new tube, the colors are colder and skin tones are darker than those obtained by CBS. Initial cost of converting your present set will probably cost more than CBS, although RCA experts have made no forecasts. David Sarnoff of RCA says new color sets will probably run around 20 to 25 percent more than comparable black-and-white jobs. This presumes quantity production, which RCA says will take one to two years. RCA breaks each line into "dot sequential" system.

CTI is all-electronic and compatible. But it uses a "line sequential" system. Each line in the picture is alternately red, blue, and green. Overlapping creates the full-color illusion. However, the Washington tests I witnessed weren't good. Colors weren't true, nor were they in register.

FCC Must Decide

Since the RCA single tube licks the receiving problems of all three systems, it's bound to bring color TV nearer. But until the FCC acts you can neither pay your money nor take your choice. The FCC can:

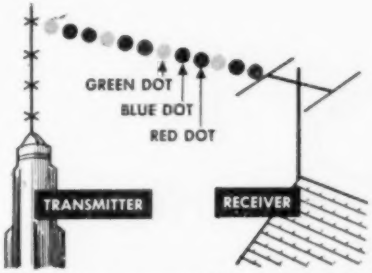
1) Approve one system;

2) Approve two, or all of them (which would toss the problem into the customer's lap, on a "let the best man win" basis); or

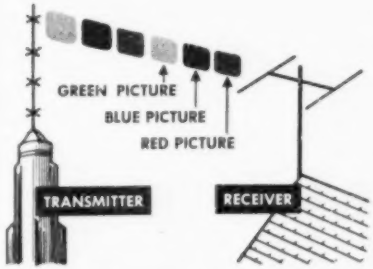
3) Approve none and tell the boys to go back to their labs. It did this once before.

But it must decide something. Because, until it does, no new TV stations can be built. And TV will have to stay within its present frequencies instead of moving up into the ultra-high bands. Besides, until industry engineers stop messing around with color, your black-and-white sets will get no better. END

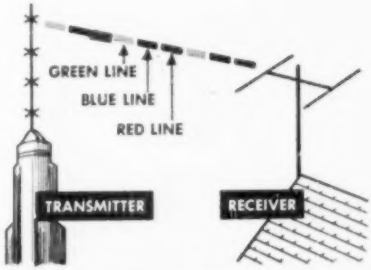
How Color TV Systems Differ



RCA's "dot sequential" system breaks up each line into individual microscopic specks of red, blue, and green. These are transmitted one after another.



CBS's "field sequential" system sends complete picture in one color at a time. Successive pictures are red, blue, and green. New RCA tube can be used with it.



CTI's "line sequential" system transmits color in successive lines of red, blue, and green. These overlap in receiver in way that gives illusion of full color.

Fabric dome, 20 feet high and 30 feet across at base, is kept inflated by compressor. In center is large movie projector, ready to be moved in. Dome recently withstood 75-m.p.h. gale.

Inside dome, students follow movie target with dummy gun. Gun's sights, also projected onto dome, show instructor how close students are to yellow spot (invisible), correct point of aim.

Portable Domes Train Gunners

The British are training antiaircraft gunners in portable fabric domes inflated like balloons to hold them up. Inside each dome, called a Portabel, a movie projector throws images of planes and other moving targets on the walls while student gunners follow them with a dummy gun. An image of the gun's sights is also projected onto the dome, showing how the gun is pointed. A yellow spot on the film indicates the correct point of aim but can be seen only by the instructor—the students wear yellow glasses. Gun sounds and other battle noises help give combat realism. Designed to save costly field training, the domes can be put up in two hours by unskilled crews. After training at one location, they can be packed into trucks and moved to new areas.

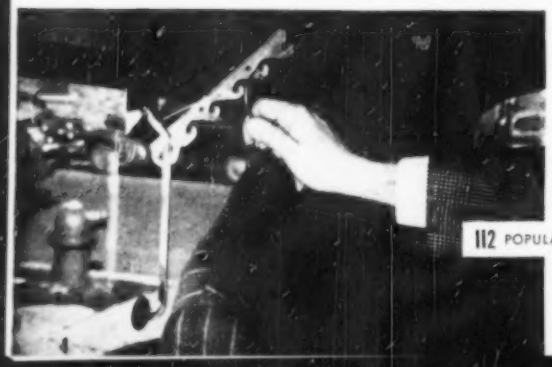
Double-door air lock lets men and equipment enter inflated dome without air escaping.

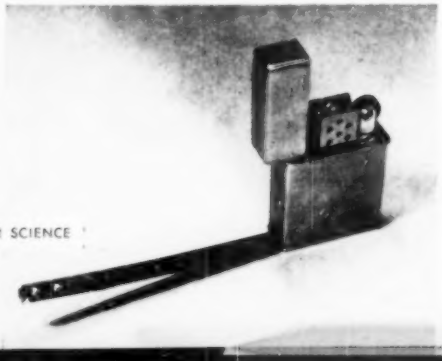
Hanger Hooks on Car Window

Traveling motorists can carry up to 10 garments on this new Hangaway Car Hanger. The top hooks over a window edge while the lower end is held to the glass by a suction cup. Made by the American Steel Products Co., Chicago, it sells for $1.29.

Lighter Has Built-In Rule

Engineers, shopworkers, and sportsmen who like to carry a pocket rule as well as a cigarette lighter can do both with this new Ruliter. Made by the A. B. Hastings Corp., of New York City, the lighter has a 24-inch steel measuring tape built into its base.



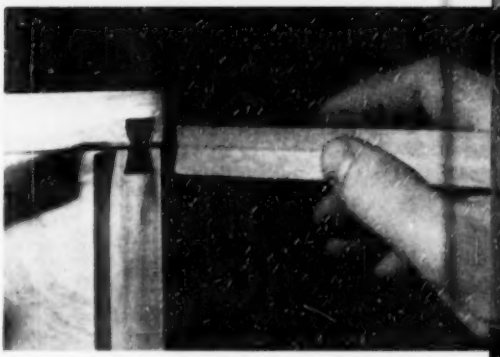


Prefab Furniture Slides Together

The butterfly dovetail, a favorite of early cabinetmakers, makes a comeback in new build-it-at-home furniture.

By Sheldon M. Gallager

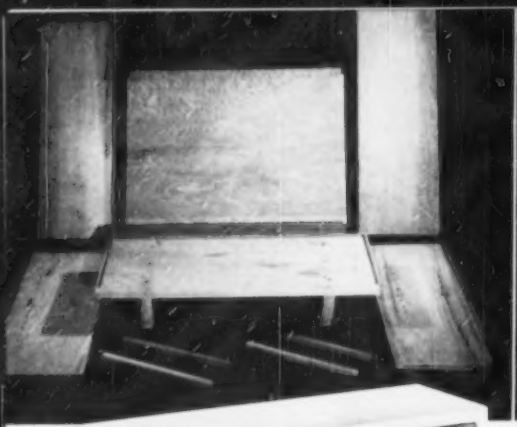
PS Photos by W. W. Morris

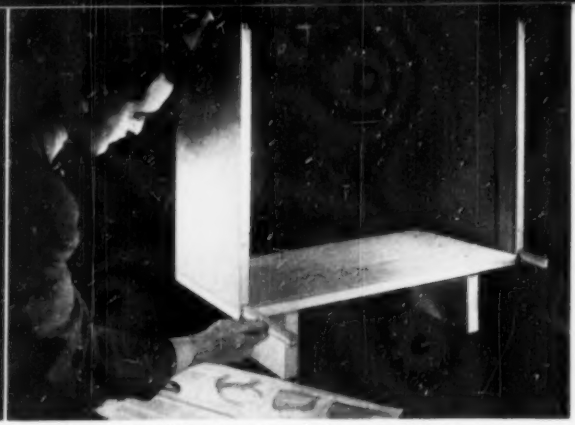


Slide-assembly principle is shown above. Matching dovetail grooves in joining pieces form a double dovetail socket. Spline, called butterfly, is then slid in, locking pieces together.

YOUNG furniture designer Walter E. Blum started out to build some cabinets for his small New York City apartment and ended up with a brand-new kind of furniture. Now he's in business, busily turning out pre-cut pieces of his furniture for other small-space dwellers to put together.

Blum calls his creation Slide Assembly Furniture—and it is literally just that. All of the pieces come cut to exact size and slide easily together, requiring only glue to hold them in place. To make this possible, Blum borrowed a trick, called a butterfly joint, from the oldtime makers of fine furniture.





Bookcase kit (left above) includes everything needed for assembly, even glue, glue brush, and sandpaper (not shown). Construction begins by fitting sides to base, which comes with legs already attached. Matching grooves in sides and base are lined up and splines are slipped in.

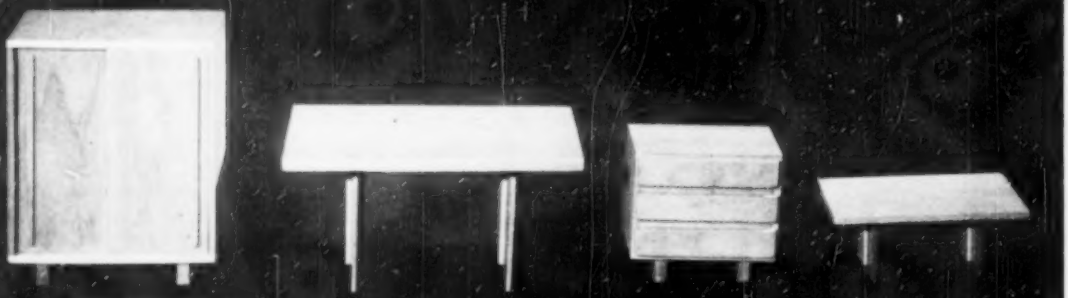
Finished bookcase—assembly time about 10 minutes. Shelf rests on brackets that can be pushed into different holes to adjust its height.

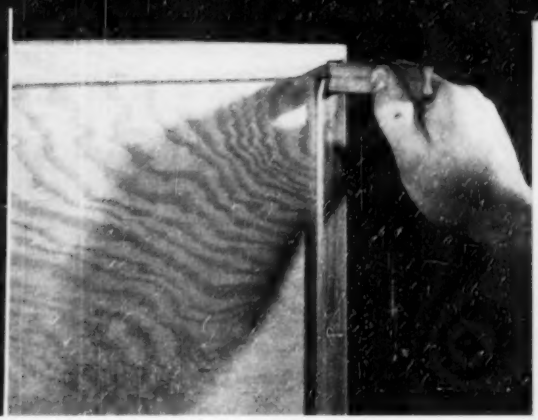
All the purchaser has to do is line up two matching dovetail grooves, one in each part to be joined, and slide in an interlocking piece that holds the two parts firmly together. Some of the units, like the coffee table and dining table, can even be left unglued in part, permitting quick disassembly for storage or moving.

Except for the tables and a taller wardrobe, all of the modular, multipurpose units are scaled to the same height—28 inches—so they can be grouped in any combination and easily interchanged. For fuller use of limited space, two units can be stacked together by simply removing the legs from the upper one. And all stand high enough off the floor so they clear the baseboard and fit snugly against the wall, giving the sleek, modern appearance of built-ins.

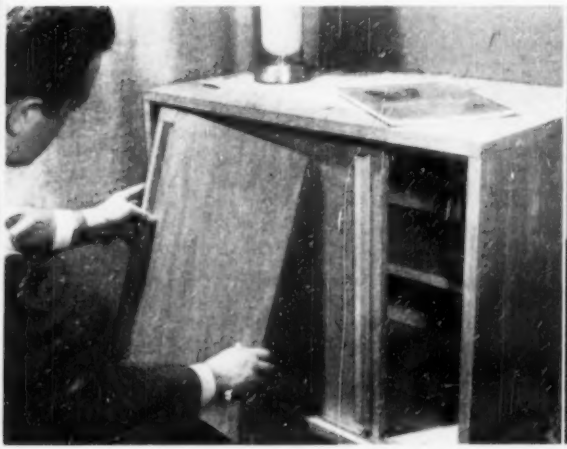
By mass-producing the pre-cut, pre-grooved pieces, Blum figures he saves the purchaser money while at the same time providing him a type of construction usually found only in expensive furniture. His present designs, available from the Walter E. Blum Co., of New York City, are shown below. Prices range from $16 for the bookcase to $87 for the large wardrobe.

Tiny models of slide-assembly furniture show (left to right) sliding-door wardrobe, dining





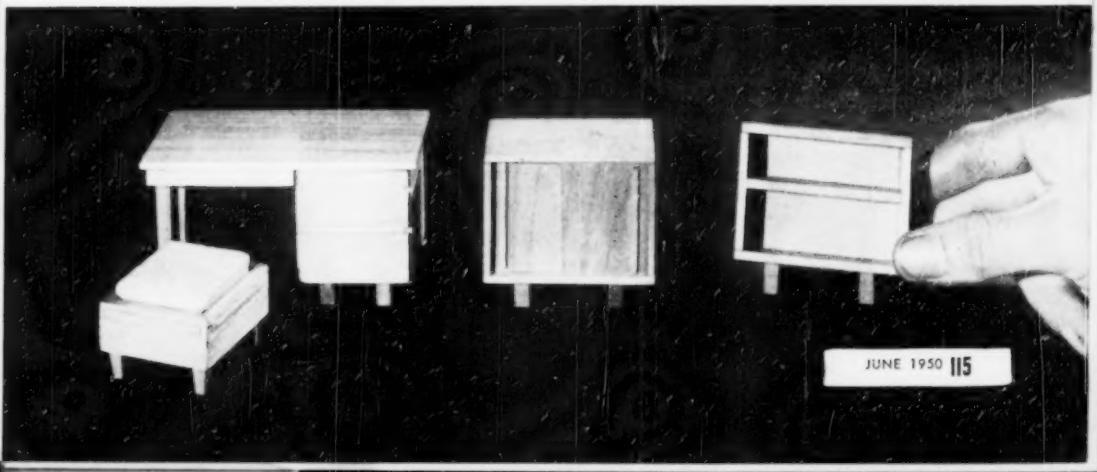
locking pieces together. Splines are inserted from rear and grooves are blind—run only part way through—so splines can't be seen from front. For permanent assembly, grooves are first given thin coat of glue. Next step is to slide the back down between upright sides. Grooves in sides and base hold it in place. In final step (shown above) top is laid on and upper splines are inserted. Thorough sanding completes job. Wood comes with veneer of either birch, shown here, or maple, can be given natural, blond, tinted, stained, or painted finish.



Slight clearance at top of sliding doors permits lifting doors out of track and removing them, making it easy to re-adjust shelf or install large units like radio or television set.

Small stool serves as desk chair or ottoman, has space inside for typewriter or record albums. When not in use, it fits out of way under desk. Several used together make sectional seat.

table, three-drawer chest, coffee table, desk and stool, sliding-door cabinet, and bookcase.



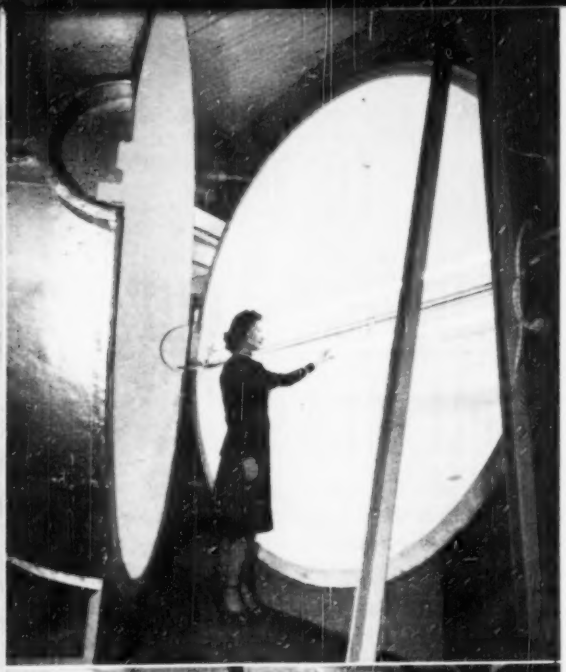
Hauled to a site by trailer truck, the folded center section is raised by four house jacks. When the trailer has pulled out, the house is lowered to rest on its own built-in supports.

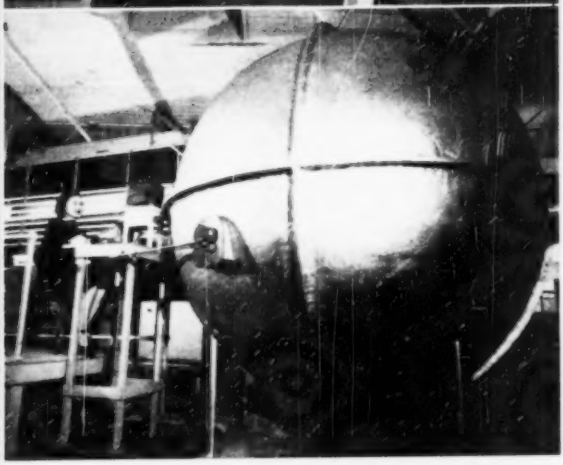
Folding House Moves by Truck

ON MOVING day, two bedroom wings fold into the center living-room section of this pre-assembled cottage, making a compact 22-ft. by 7½-ft. package for truck transport. The folding feature is made possible by placing all plumbing and wiring lines in the middle unit. The Terrapin house can be occupied six hours after delivery. It was developed by the British as temporary housing at construction sites and other areas without permanent housing.

The house is quickly expanded to full size by swinging out walls of the 7-ft. by 13-ft., 9-in. bedrooms. Outside walls and ceilings are covered by sheet aluminum, and are fully insulated.

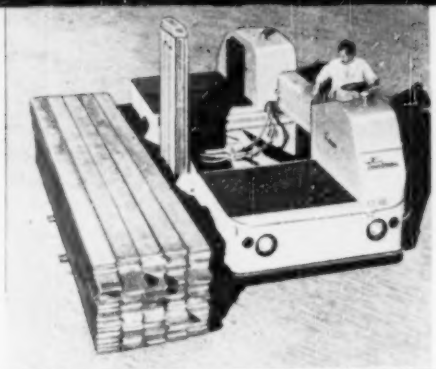
Six hours after delivery, the house is ready to be hooked up to water, power, and drainage lines. The 333-sq.-ft. floor area includes a kitchen-bath unit in rear of the living room.





Giant Sphere Measures Light

To MEASURE the light output of eight-foot-long fluorescent tubes that wouldn't fit inside the small spherical photometers used to test ordinary light bulbs, Westinghouse engineers designed this huge one. Top photo shows the 700-pound, 12-foot-high plastic sphere open for interior adjustment. When it is closed, prewarmed tubes are fed in mechanically through the side on a track. Their light, bouncing off all points of the sphere, is then reflected onto a sensitive photocell that records its intensity on meters outside.



Side-Lifter Speeds Loading

THIS new side-loading hydraulic-lift truck can pick up a 30,000-lb. load and be off at 30 m.p.h. in 20 seconds. Carrying its load lengthwise instead of crosswise, it can easily maneuver in narrow aisles or on ordinary roads. To load, its fork extends out sideways after hydraulic jacks have braced the machine against the ground. For stacking, its fork lifts 12 feet; special arms can increase this to 17 feet. For carrying or unreeling cable spools, it can be fitted with a self-powered spindle. The Traveloader is made by the Lull Mfg. Co., Minneapolis.

Well-drilling rigs like this one are a familiar sight when homes are built beyond the city-water limits. Population growth and increasing needs make old-fashioned wells inadequate.

What to Do Before Your Well Runs Dry

New drilling techniques and jet pumps help slake the countryman's growing needs for plenty of pure water.

By William Gilman

Photos and drawings by Eleanor Gilman

SO YOU'RE planning a new home beyond the city water mains, or remodeling an old one? It should be built on a firm foundation: pure water, plenty of it. That's something too many people who want city conveniences with country living are liable to forget. A little planning will save a lot of expense and grief later.

Recent publicity about New Yorkers going without baths and shaves only dramatizes the situation. From Maine to California, municipalities are doling out water, hunting new supplies, debating what's happened to Nature's water spigots.

Less publicized is the plight of the home owner whose automatic pump starts sucking air instead of water. Even if you can borrow some for drinking, you're in a first-class jam because of your dependence on water in modern living. The toilet won't flush, the hot-water heating system leaves you cold, and the electric washer just stands there looking pretty.

Even so, you can usually pull yourself out of your hole, while your city brother has to wait for vast new engineering projects to be planned, debated, and finished. Unless you live in a really arid region, you can have an expert shoot a deeper well, which usually solves the problem, or put down a new one. The price these days is around $6-$8 per foot plus cost of materials.

Improved drilling technique makes costly dry holes pretty rare. Strainers developed

in the past 10 years allow wells to draw clear water even from quicksand. You may have to go through rock, and so get more dissolved minerals in the water—but modern softeners can overcome hardness.

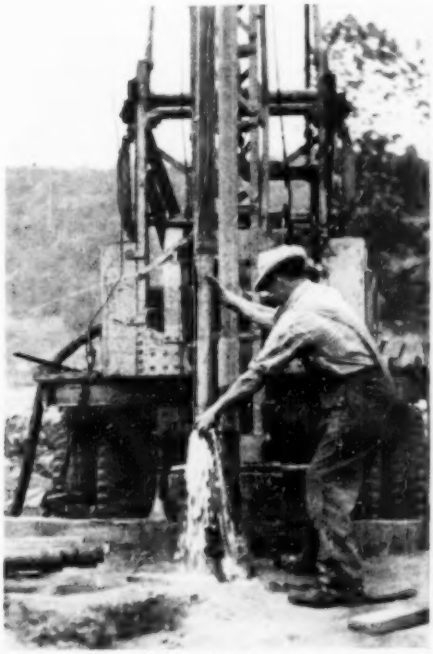
Then there are the comparatively new ejector or jet pumps that make push-pull piston ones look almost as backward as the old oaken bucket. You can even get a submersible outfit with a pump and motor that swim hundreds of feet underground.

Pioneers found water first, then built their cabins next to it. Drillers swap stories about many moderns who go ahead building a layout complete with swimming pool and automatic sprinklers, phone for a water-finder afterward, then hover nervously as his expensive hole goes deeper. Plumbers complain of the householder who expects a boy-sized pump to do man's work, or a man-sized one to draw from a well that can't keep up.

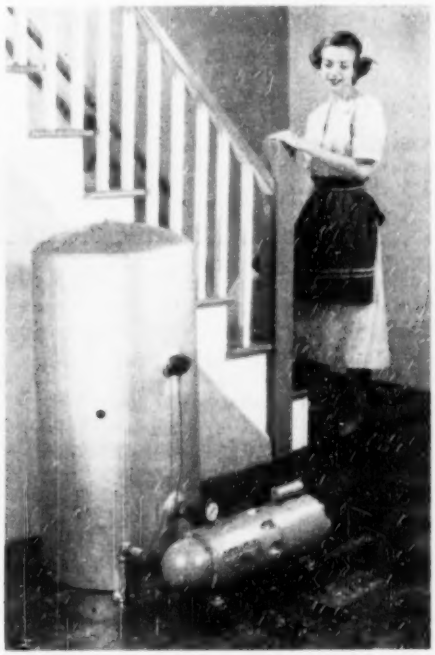
Recent droughts have been, in a way, a blessing in disguise. Experts agree they have brought the real trouble to light—the inadequacy of hard-pressed water systems that can't stand our growing demands on them. Living closer together increases our pollution problems, and living easier makes our water needs much greater. We've become a well-scrubbed nation, with even the family car being washed down at six gallons per minute. But water won't stretch. That's why it's best to take pad and pencil before deciding on the new well and the pump for it.

The average daily consumption per person in a modern home is figured at 40 to 50 gallons but varies widely and can easily run 100 gallons. Figure it out for your own home from the following table:

	Gal.
Shower bath	35
Bathtub	25
Toilet, each flushing	6
Lavatory basin, each filling	1½
Horse, daily	15
Cow, daily	25
Hog, daily	2
100 chickens, daily	4
Laundry tub	6-10
Kitchen sink	5-8
	Gal. per minute
¾-inch hose	6
Lawn sprinkler	3½



After a well is drilled, plunger-type pump is attached to rig to test water flow. On deep wells of over 100 feet, same type of pump, driven by electric motor, is often used permanently.

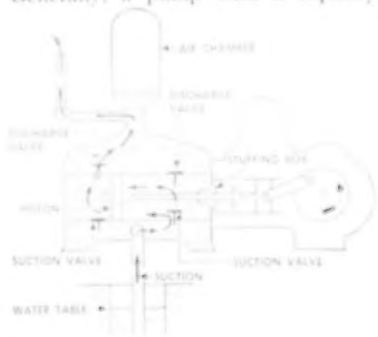


Small, streamlined jet pumps are becoming standard in many homes. This one lifts water about 20 feet, automatically starts when pressure tank gets low and shuts off when it builds up.

But after you've calculated daily gallons, remember there will be peak demands at times like Monday's washing or the morning hour when kids keep the bathroom humming. If you don't want pumping trouble, allow for peaks when clothes washer, dishwasher, shower bath, and lawn sprinkler may all be going at once.

One rule is to add up all outlets that will be in use at the same time, and figure each will need three gallons per minute. A small family might squeeze by with a well producing 2 gallons per minute and a large air-pressure tank for a reservoir. But a 5-gallon-per-minute one is safer, especially with a fast-working pump.

Generally, a pump with a capacity of



Old faithful among pumps is this double-acting, reciprocating type. Like jet, it lifts about 20 feet, but can operate on smaller water supply. For deeper wells, piston is in well pipe itself.

around 300 gallons per hour will handle the small home comfortably. One of around 600 g.p.h. is best if your daily needs run between 800 and 1,200 gallons.

If your needs require a deeper well or new one, get a reliable man for the job because he'll have know-how and proper equipment. Water engages in tricky underground activities. At a Connecticut estate, it rises and falls in a well with ocean tides 20 miles away. In sections of Michigan, a well may bring up salt brine. In Louisiana, it can be so near the surface that it floats the oil tank you're trying to bury. In Indiana, one home owner gets his cooking gas and water from the same 100-foot well.

Roughly speaking, there are two kinds of water—surface and ground. Surface water, piped from streams, ponds, and some springs, can be used for many purposes, although in populated areas it's generally unsafe for drinking. Many rural dwellers with drought-hit wells use centrifugal pumps to supply surface water for gardens, livestock, irrigation, and fire protection.

Ground water is the old stand-by for home needs. It's rainfall percolating down into spongy gravel and sand, and collecting in pores and crevices of underlying rock. This ground water is in constant movement. Its upper surface is the water table, which sinks in dry seasons. Sometimes you can tap it from natural springs and fissures. But usually the trick is to get it up a pipe by suction.

The old-fashioned stoned-in well is often sufficient, but because of pollution dangers and lowering of the water table by drought and heavy use, most wells these days are going deeper. It's done by driving pipe through softer stuff, drilling in rock, and bailing out the muck. The result is a tubular well formed by the pipe casing.

Rock Man and Gravel Man

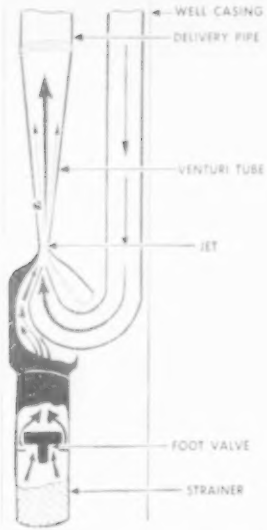
An experienced driller knows the terrain, where to shoot, and how deep he may have to go. He can read tell-tale signs in the mud he bails out. He's most valuable if he's both a "gravel man" and a "rock man" instead of a specialist in just one. Some of the best wells are brought in, at less expense, from spongy sands and gravels above rock.

One driller gave up after going down 640 feet, most of it through rock. He had cased right past water-soaked gravel that a new well tapped at only 70 feet.

It's a knack knowing how to gravel-pack a well properly—how to pump out sand and leave a screen of natural gravel to act as water filter. If it can be done, that's the best way.

Drillers say their biggest help in the past 10 years has come from the new, noncorrosive screens that make it possible to draw clear water from beds once shunned. Such a strainer, either within the casing or placed below it by jacking up the casing, may be 50 feet long and any mesh desired. One driller went down 150 feet and hit genuine quicksand that oozed 100 feet up the well. Instead of giving up, as he would have formerly, he installed the proper screen—and that well now draws 40 g.p.m. of crystal-clear water.

Figuring a well's capacity is more than calculating how much water is down there. It may stand 100 feet in the pipe. But when you start using it, how fast will new water



High-speed, twin-pipe jet pump can lift water 120 feet. Stream shooting down pipe at right through jet nozzle and into venturi tube creates vacuum that draws well water up pipe at left.

come in? That's why the driller uses a test pump to find the "draw-down point" where the well is giving as much as the pump is taking. This gives the gallonage you compare with your needs and use in determining the size of pump to install.

It's necessary to watch out for trickery down the well, which may be drawing from a temporary pocket in rock and do fine until that supply is emptied—and then the level drops like a plummet. Overnight the pocket may refill and repeat the trick. That's why a good driller will pump eight hours steady before he is satisfied with the test.

There are many types of motor-driven pumps—but for home use you're likely to pick a reciprocating or jet one. The former is the old reliable that's based on the hand-pump principle of a piston stroke pushing out water, leaving reduced atmospheric pressure behind to bring in more water for the next boost. Shallow-well types lift water about 20 feet (lift is from water table to pump—not delivery height) and are handy for basement installation. If you need more lift from a piston pump, there are deep-well models in which the plunger is worked up and down the well.

Piston types are fast being outmoded by jet pumps. Most manufacturers have begun putting out lightweight models that are non-corroding, self-priming, and quiet. Many come mounted right on a 15- or 30-gallon pressure tank, providing a neat package to fit any small corner. These high-speed pumps—a ½-hp. motor delivers 600 g.p.h. at 20 feet suction lift—work on a combination of venturi and centrifugal principles.

The only moving part is the spinning impeller. While whirling part of the water through a discharge pipe, it sends the rest back down through a line ending in a jet. As the high-pressure stream sprays out into a cone-shaped venturi tube, it creates a partial vacuum, pulling more water up the well to within reach of the impeller. The outfit is really two pumps working together.

The jet's only disadvantage is that it requires a good water supply behind it. Advantages are many. Unlike a piston type, its flow is steady and operation almost noiseless. It's a fast worker. As house pressure decreases, pump capacity increases—a ¾-hp. jet will deliver 500 g.p.h. at open discharge. It can go without oiling and greasing for years.

This type of jet pump is installed in house basement instead of in well casing, permitting well to be up to 600 feet from house. Here suction pipe is simply dropped down open well.

What's often important, it can be installed in the house 100 feet or more from the well. This allows a choice of where to shoot for water, and does away with need for a frost-proof pumphouse out over the well.

Theoretically, with perfect vacuum and

no friction, a shallow-well jet would lift water 33.9 feet at sea-level atmospheric pressure. Actually, its lift is usually around 20 feet. The deep-well jet is good for a 120-foot lift, and multistage versions will handle over 300 feet.

For shallow wells, the jet assembly is right in the pump. In deep-well types, it's down in the well casing. A pressure pipe goes down the well to the jet; another pipe brings water up to the pump. For smaller jobs, there is a single-pipe system in which space between casing and inner line is used in place of a second inner pipe.

If your supply turns out to be insufficient and the well needs deepening, a shallow-well jet can sometimes be converted into the deep-well type.

Motor Goes Down the Pipe

Even newer is a pump you don't see at all. With Submerga-Pump, the whole works—motor and pump—goes down the casing into the water. A heavily insulated power cable feeds it and the water itself cools it. Working on the multistage centrifugal principle, it was adapted from a design long used in oil wells. Requirements are casing at least 4 inches in diameter and water that's free of sand or other abrasives. The manufacturer claims pumping depths to 480 feet and capacities to 1,740 g.p.h. If the water table drops, all that's needed is to lower the outfit.

Whatever pump you use, it's standard to equip it with an air-pressure tank. The air trapped and compressed inside it provides energy to deliver small amounts of water, preventing the motor from starting every time you draw a cupful. It also serves as a cushion, absorbing the pulses of reciprocating pumps. The pressure switch is generally set to cut in the motor when pressure drops to 20 pounds and shut it off at 40 pounds.

Test for Pollution

Before hitching up a new system, be sure the water isn't polluted. This has always been a must, and is even more important now when homes crowd each other. Water may look clear as crystal and still be chock-full of germs. Polluted water can produce typhoid fever and a long list of other diseases. As you'd expect, a spring or shallow well is more likely to be contaminated than a deep well.

In suburban communities, wells may be fed by neighbors' drainage. Some surveys

Nature does her own pumping in true artesian well like this one at the Vermont State trout hatchery near Bennington. It delivers a steady 250 gallons a minute from depth of 110 feet.

indicate that probably half the water systems on old-fashioned farms are unsafe. The well platform or casing may not be tight enough, allowing foul drainage to come in. Or the well may be too near the barnyard.

Distance and elevation help, but what goes on underground can't be seen. Water drawn from porous ground or a seamy ledge can receive a long-distance taint. A well can even draw pollution from lower ground—when drought and heavy pumping drop the water table enough to make water "run uphill."

Supposedly a septic tank converts and purifies everything coming into it. But there has been proof to the contrary; a septic tank may be overloaded or need replacing or cleaning. Badly functioning tanks have caused deaths from polluted drinking water.

In any case, analysis is the only sure answer. No water supply should become a permanent fixture until it has been okayed by a health officer or state laboratory. For safety, take samples during both wet and dry spells. If you must use untested water in the meantime, it should be boiled or chemically treated with lime or iodine. Check with your doctor on the best method.

While installing the water system, also remember what winter may do. If you depend on a well or spring away from the

Hydraulic ram, self-powered, is dependable for moving surface water if conditions are right. Falling water keeps closing valve, causing back-pressure kicks that ram water up to tank.

house, the pipeline may have to be buried as much as nine feet deep in some parts of the country for safety against freeze-up. In wet ground, it will need less protection. If you have a good spring, you can make a small brook out of its overflow and lay the pipeline in it. Water running over the pipe will prevent freezing.

Another way is to keep water always flowing through the pipeline. This can be done by having a by-pass through the basement and out through a drain. But don't try this with a motor-pump system; constant operation can burn out the motor.

Keep a Fire Hose Handy

An outdoor system should have a shut-off valve, allowing it to be cleaned or drained if you're going away for a few weeks or longer. Another tip—whatever your system, better have a handy outlet to which a fire hose can be permanently attached.

Besides a shallow or deep well, there are three other water sources for the home. If you own a spring, its water will probably be soft, **cool,** and sparkling. It's especially valuable if located above the house, so that Nature will do all the work by gravity. My own spring, at 70 feet elevation, provides an ideal 35 pounds pressure at the kitchen sink.

A small reservoir should be dug out at the spring, or near it, to accommodate peak needs. A pair of standard concrete drains, two feet in diameter, will store around 100 gallons if you stand them on end. Hardware cloth covered by wooden lids will keep out leaves and animals.

A spring should not only be pure but faithful and adequate. Too many gush in April and can't deliver in August. If the spring is fickle it's cheaper in the long run to shoot a well.

True Artesian Has Pressure

A cross between natural spring and drilled well is an artesian supply. There's cause for celebration when the driller brings in one. Here Nature does the pumping after man provides the pipe outlet for underground water under pressure. So many drillers, as well as laymen, refer to an ordinary drilled well as an artesian that the word has almost lost its real meaning.

For a true artesian, underground water must be flowing downhill under a tilted rock formation. It wants to seek its own level but can't. Boring through to it provides an outlet and the water comes up the pipe. In some terrain, it shoots up geyser-fashion. One brought in at 3,100 feet yielded 750,000 gallons a day—shooting it 32 feet above ground.

Where conditions are suitable, a hydraulic ram can be used to give surface water from spring, brook, or pond a boost to the storage tank in the house from which faucets are fed. The ram makes water raise itself by its own bootstraps through a system of valves using the water-hammer principle. Much of its water is wasted in order to boost the rest, so the first requirement is a plentiful supply.

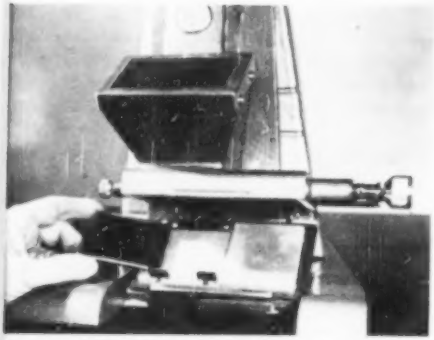
In the right place the motorless ram works like magic, raising water up to five times higher than its drop to the ram. I've seen some thudding away merrily after 50 years' service. The ram, the most economical pump in existence, requires only a valve replacement **every couple of years.** It can even be homemade (PS, Oct. '48, p. 231).

But since ideal conditions are rare, the ram is fast becoming a curiosity as power lines keep spreading through rural areas. They allow you to hitch up an automatic electric pump that's inexpensive and dependable. In harness with a proper well, such a pump will bring up the water that's still abundant underground even when drought is doing its worst up on top. END

Midget 'Scope Rivals Biggest

A TABLE-TOP electron microscope, to be introduced by RCA this September, approaches the world's mightiest instruments in power. It magnifies directly up to 6,000 diameters, and takes pictures that can be further enlarged to 50,000 diameters.

Permanent-magnet lenses of newly available material, replacing the electromagnetic coils used in big electron microscopes, permit the extremely compact and simple design. Auxiliaries are a power-supply cabinet, two vacuum pumps, and a control panel. The midget 'scope is expected to sell for less than $6,000, enabling it to become a standard tool in hospitals, and in college and even high-school laboratories.



To get portrait of a virus, user inserts plate holder as above. Simply pulling out knob at right, and pushing it back, makes the exposure. Enlargement from plate reveals finest details.

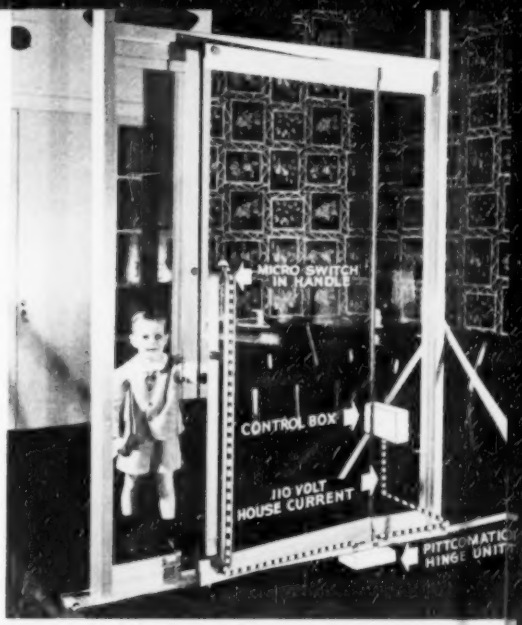
Table-top 'scope made this picture showing tobacco mosaic virus magnified 40,000 diameters.

Tiny holder containing specimen, placed with forceps in slide of new microscope as shown, is pushed by knob into viewing position. Copper sphere encloses 50,000-volt electron gun.

As simple to operate as an ordinary microscope, new table-top electron microscope has magnifying power more than 20 times as great, approaching that of mightiest instruments in world.

48 Radio Tubes Built in One

By building 48 separate tube "units" inside one tube, RCA engineers have made what they believe to be the most powerful electron tube in the world. Intended primarily for radiotelegraph and international broadcasting stations, it can put out 500,000 watts continuously. In the photo above, the top has been lifted to show the cylindrical arrangement of the 48 separate triodes that make up this "Super-Power Beam Triode."

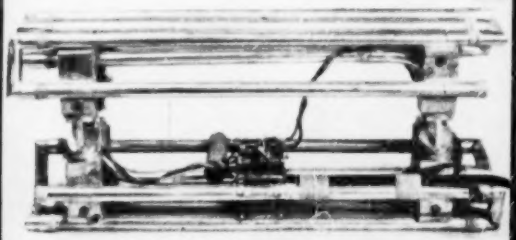


Power Door Opens at Touch

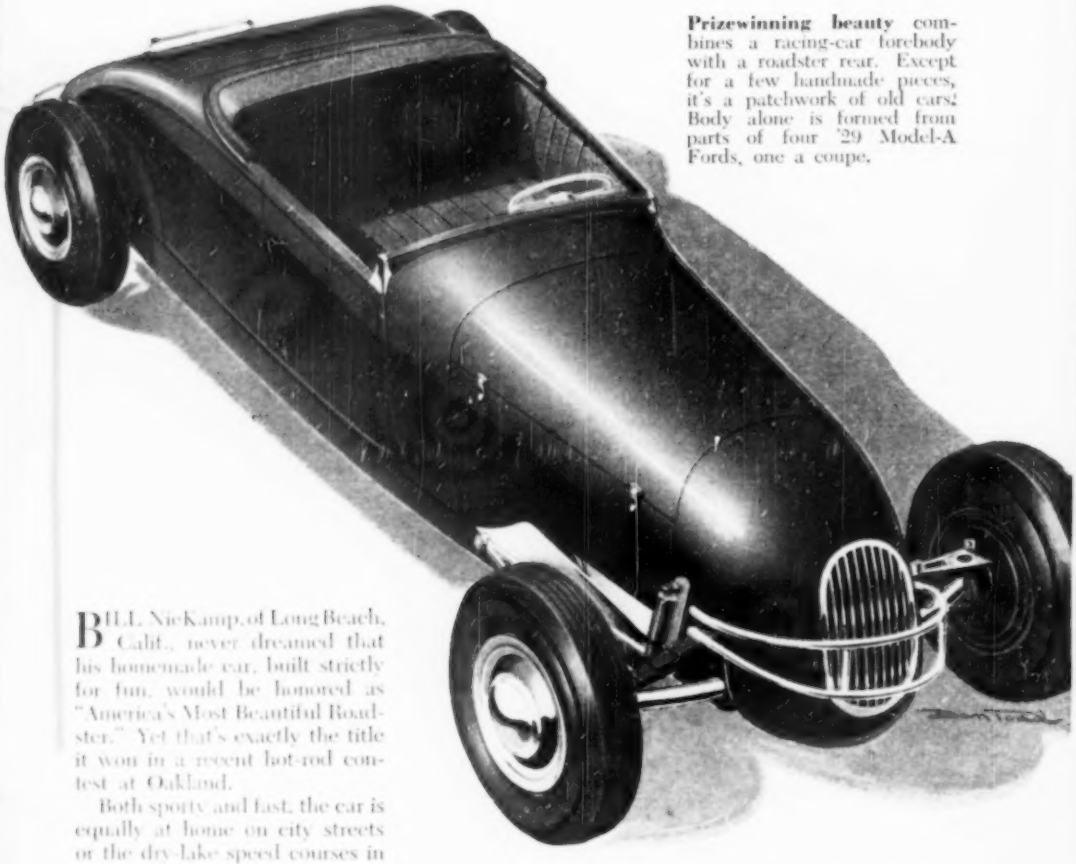
Just a touch on the handle, even by small fry as above, and this door opens. The invisible doorman is an electric-hydraulic power hinge, hidden under floor or sidewalk and actuated by a microswitch in the handle. Unlike electric-eye devices, it needs no obstructing posts and opens doors both in and out. The power hinge, called Pittcomatic, was developed by the Pittsburgh Plate Glass Co. primarily for heavy glass doors.

Sensitive TV Mike Picks Up Sound Selectively

Cluttered television studios may be freed of bulky microphone booms and dollies by a new type of directional microphone. Its "aim" is so sharp it can pick up wanted sounds 12 feet away while ignoring those not desired. Two of these RCA microphones are shown suspended above a stage set, below left, while a technician at a console switches from one unit to another to follow the actors. Each unit, shown at right below, uses two microphones, with eight feet of acoustical pipe for directivity.



Homemade Roadster Wins Beauty Contest

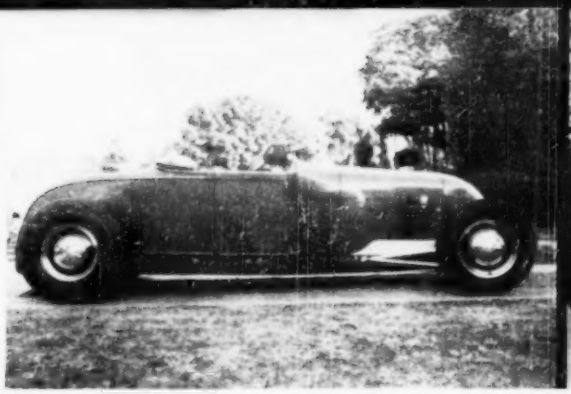


Prizewinning beauty combines a racing-car forebody with a roadster rear. Except for a few handmade pieces, it's a patchwork of old cars: Body alone is formed from parts of four '29 Model-A Fords, one a coupe.

BILL NicKamp, of Long Beach, Calif., never dreamed that his homemade car, built strictly for fun, would be honored as "America's Most Beautiful Roadster." Yet that's exactly the title it won in a recent hot-rod contest at Oakland.

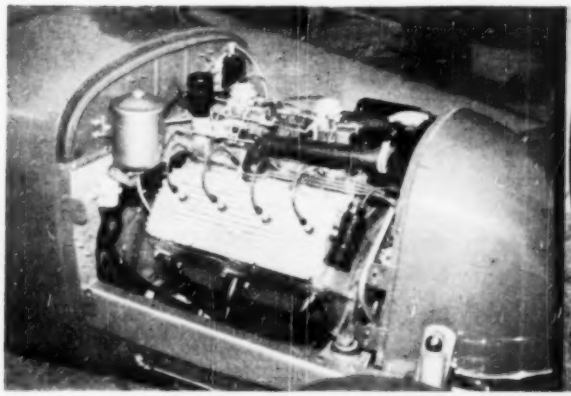
Both sporty and fast, the car is equally at home on city streets or the dry-lake speed courses in Southern California where NicKamp frequently races it. Building it took him an estimated 300 working days, spare time from his regular job as an automobile painter. As you'd expect, the body finish is gleaming, set off by chromium plating on much of the running gear. The car's clean lines don't betray its patchwork origin.

Double sets of rear-end shock absorbers provide smooth riding as well as good control. For speed runs, the twin asbestos-wrapped mufflers can be quickly removed and replaced by racing stacks, which are installed through special snap-out plugs in the belly pan. Both the firewall and pan are designed to conduct ample cooling air past the engine during high-speed desert runs. For night driving, a pair of headlights can be quickly fitted.



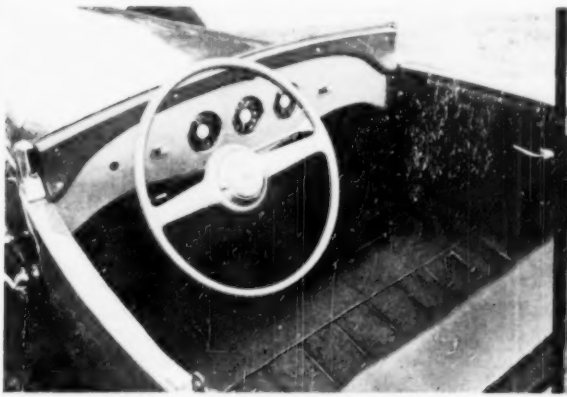
Roadster has '39 Ford rear end, with torque tube shortened 18½ in. Drive shaft is Model A. New wheelbase is 110 in. Frame rails are from '27 Essex, fitted with Model-A rear crossmember.

Aluminum cowl and hood, together with grille, were handmade. The front axle is from a '39 Ford, but has been fitted with earlier-model spring perches. Brakes are '41 Ford hydraulics.

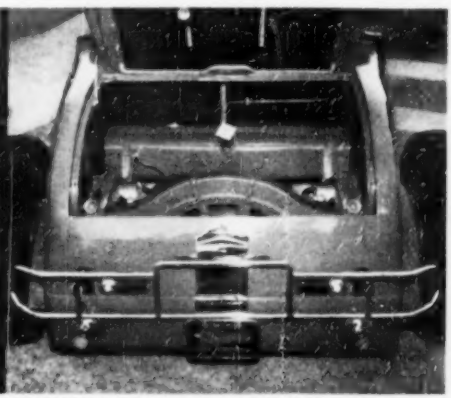


Speedy engine is '42 V-8 Mercury, of stock bore and stroke, with Evans heads, Weiand manifold, Kurten ignition, and Thompson 3-ring pistons. Rear support is Model-A crossmember.

Unusual steering mechanism is '35 Ford cross-steering assembly turned on side, racer style, for ground clearance. Rear axle has teardrop fairings built around it to cut air resistance.

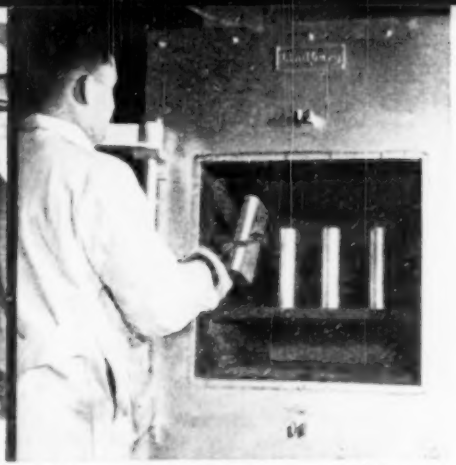


Dashboard is clean and simple, with '49 Plymouth instruments grouped in center. Steering-column gear shift and transmission are from '49 Ford. Headlights are added for night driving.



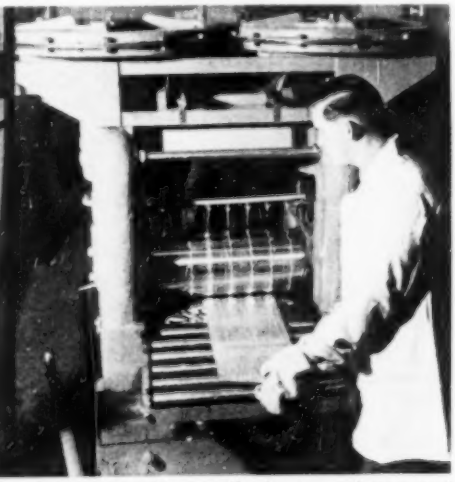
Rear end boasts two sets of shock absorbers, a pair of Houdaille needle-adjusted Fords and two tube-type Gabriels mounted at 45° angle to control body sway. Gas tank is '28 Chevy.

1 **Molten metal** is poured into a mold during the process used to make aluminum sheeting at the Kaiser Co.'s miniature mill, where alloys are tested before being run through big mill.



2 **After a 23-lb. ingot** is removed from its book-shaped mold, it is placed in an electric furnace with other ingots for a heat-soaking treatment to bring them to rolling temperature.

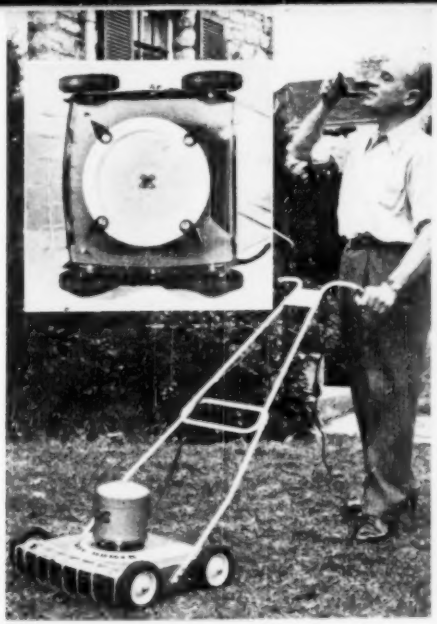
3 **When an ingot** has been properly heat-soaked, it's pushed in for its first pass through the baby rolling mill. A 50-hp. motor runs mill, which can make sheet only .01 in. thick.



4 **Operator above** pulls aluminum sheet out of machine, whose rollers squeeze with a pressure of 700,000 lb. A full-size mill uses 2,000,000 lb. of pressure to flatten a 5,000-lb. ingot.

Midget Rolling Mill Trys Out Alloys

BEFORE a new alloy is okayed for use in the huge Kaiser aluminum rolling mill at Spokane, Wash., the metal is given a trial run through the pint-size version shown here. On a small scale, this pilot plant duplicates all the complex processes of its big brother that squeezes 5,000-pound ingots into nearly 125,000 tons of sheet, strip, and plate aluminum annually. Miniature ingots weighing 10 to 23 pounds are fed into the six-foot-high rolling mill. After the alloy castings have been rolled into thin sheets, they are heat-treated and then carefully tested for strength and hardness.

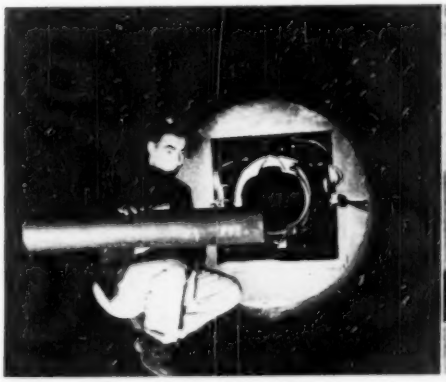


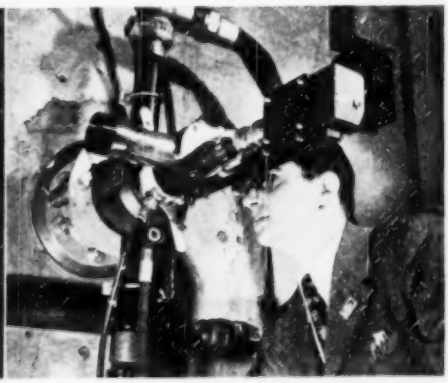
Mower Works Like Scythe

CENTRIFUGAL force holds in cutting position the four 2¾-in., free-swinging blades of the lightweight ⅓-hp. electric mower pictured above. The blades are mounted on the rim of the horizontal disk seen in the underside view (inset), which revolves at high speed. Built by the Huffman Mfg. Co., Dayton, Ohio, the mower cuts a 16-in. swath. It will mow to within ½ in. of any obstacle when a front wire guard is lifted.

Colors Warn of Ray Peril

A NEW civilian-defense Geiger counter, developed by the AEC, has a tricolor scale to gauge radioactivity after an A-bomb blast. Its needle swings to green in a safe area, yellow where it is unsafe to tarry long, and red as a warning to get out at once. Topmost reading, five roentgens an hour, is a new high for Geiger counters. Powered by flashlight cells, the device could be mass-produced for only $10 to $15.



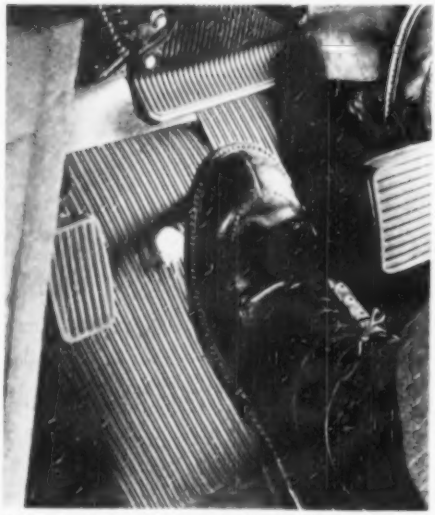


Periscope Looks Into Jet

MOUNTED squarely in the 2,500° exhaust blast of a jet engine on a test stand, the stainless-steel periscope above gives a close-up view of an inferno. Standing at the eyepiece on the opposite side of a wall from the exhaust, as seen in picture above, a GE engineer can study the pattern of burning gases. For a permanent record, color movies may be made through the 'scope. A cold-air blast protects its inner window of quartz, and a 45-gallon-a-minute water-cooling system also safeguards both window and tube.

New Car Radio Finds Stations for You

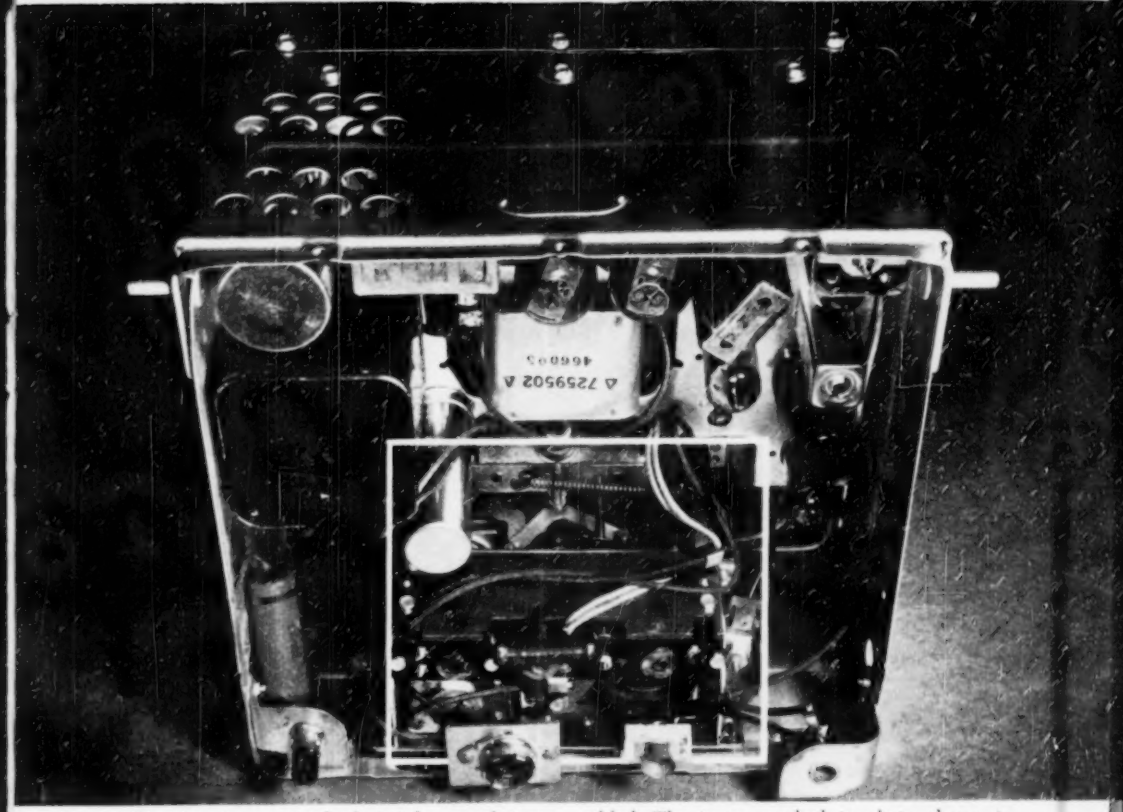
Dashboard controls appear conventional—except for bar, to let passenger select stations, and sensitivity control. This adjusts tuner to stop on all stations, or to pass by the weaker ones.



Selector button is next to brake. Each time it's pressed it tunes radio automatically to next station within range regardless of where car is. No presetting to station frequencies is needed.

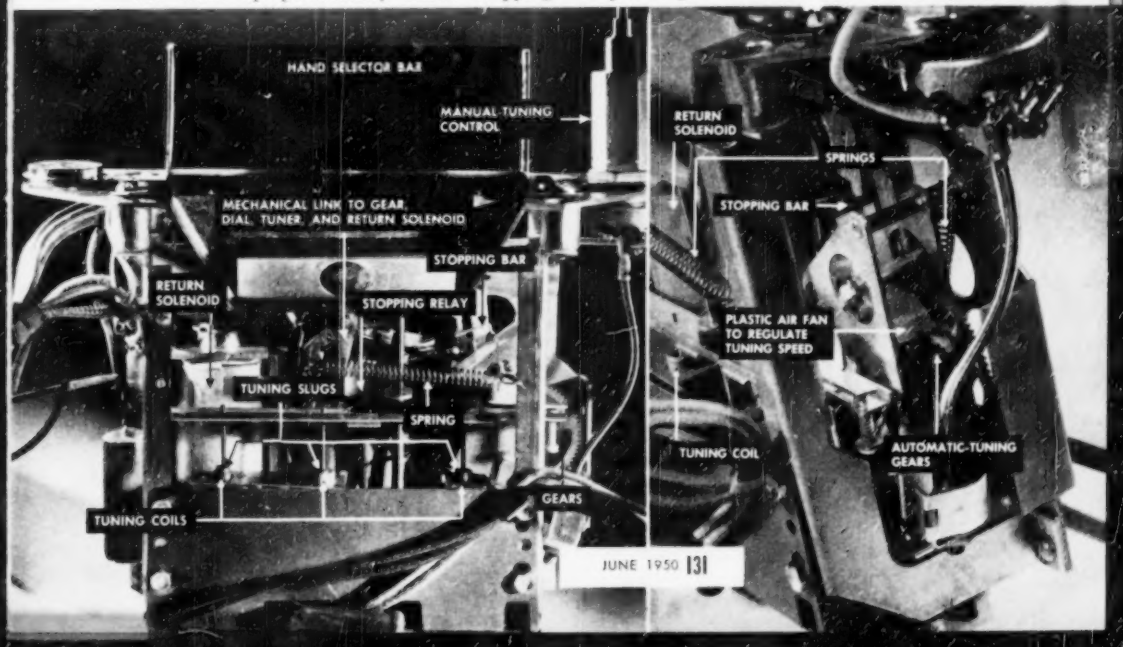
THERE'S a real "lazy-man's radio" in some of the new Buicks. All you have to do is press a button, whereupon the Selectronic receiver searches for a station and stops right on it. If you don't like that program, press the button again and it hunts the next one, and so on. Unlike ordinary preset push buttons, which are useless when you drive beyond the area they were adjusted to, this gadget works anywhere in the world. You don't have to know where stations are on the dial.

A simple clockwork gear train, a relay and solenoid, and one extra tube turn the trick. Pressing the button lifts the brake on the gears. Spring loaded, they tune through the broadcast band until a signal is picked up. The signal fires the trigger tube, which resets the brake. This stops the tuner right on the station—much more accurately than you could set it by hand. The trigger circuit discriminates between stations and power-line noise or static. When the tuner has crossed the dial, a solenoid automatically pulls it back and hunting starts again.



The chassis is a standard six-tube superheterodyne, to which the automatic tuner has been added. The tuner, marked in photo above, is shown below as it looks when removed from set.

Gear train, shown in close-ups below, starts tuning across dial when stopping bar is lifted by relay. It tunes by raising slugs out of coils that make up permeability tuner. Stopping bar brakes gears at station when trigger tube, fired by signal, trips relay. When slugs are all the way out, switch energizes solenoid to pull slugs back down and reset the springs.



Barn raising is an old Pennsylvania Dutch

Farmers Raise A Barn

By Grant Heilman

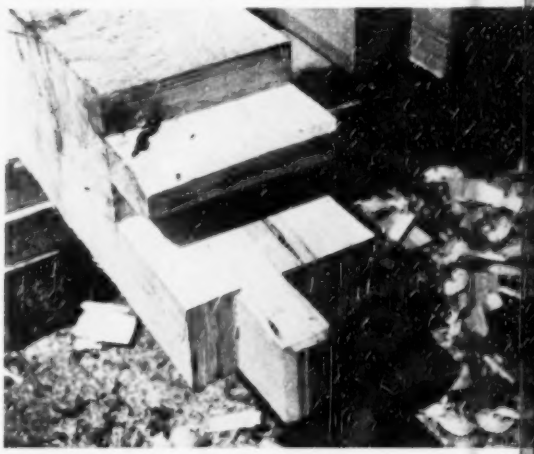
PREFABS may be the hottest thing in the building trade, but they're old stuff to Pennsylvania Dutch farmers. They've been prefabricating and "raising" barns for generations.

Barn builders like John Gehr, who super-

Old-fashioned hand auger is used to drill holes for pegs. Lower part of barn frame is made of oak, and siding of Pennsylvania white pine.

custom. Here neighbors arrive for big event.

In the hands of an expert, the adze is a versatile tool, and can cut a chip the size of a man's fist, or slice a shaving as thin as paper. Cutting blade must be kept razor sharp.



Strength of the completed barn depends on complicated joints, such as the *cesel fuus* (mule's foot) shown above. All joints are cut before any part of the barn is assembled. It takes experience to know where each should be used.

vised construction of the one shown here, near Ephrata, Pa., don't even use blueprints or drawings. The only paperwork involved is in calculating the amounts and costs of materials—about $12,000 for this barn.

Gehr and his skilled carpentry crew work for several weeks before the actual "raising." They cut more than 500 timbers to size, notch each one according to the position it will have in the finished frame, and drill each timber for the wooden pegs that will hold it in place. As each piece is finished, the carpenters place it on the ground beside the pieces to which it will be joined.

All this painstaking labor pays off when more than 100 volunteer helpers show up on the day of the raising. Under Gehr's direction, it takes them less than five hours to assemble the framework. Every piece fits exactly, and the only tools used are hammers, pike poles, and crowbars.

"It's just like a jigsaw puzzle," says Gehr. "There's nothing to it, especially after you've been building them for 40 years."

Not a single nail is used in the framework. Hundreds of sturdy oak pegs, like those below, are cut before raising. They are driven into holes drilled in the timbers, then cut off flush.

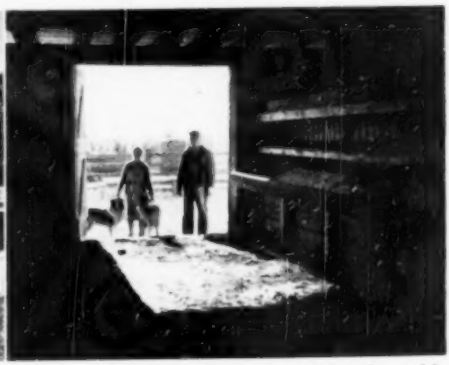
Old-fashioned muscle power puts giant beam where it's needed. Longest single timbers, 45 feet, span entire width of barn. Steel girders are used only in foundation against damp hillside.

Carpenters use block and tackle to lift joists into place. These run the length of the barn, and are set into the stone foundation. Supporting posts are set in concrete on barn's floor.

Everybody gets into the act for a major raising job. The men are using long pike poles, or "stockades." The entire section, including diagonal braces, was preassembled on the ground.

Here first of the top rafters are swung into place. Roof is of gambrel type, with a flatter slope at the top. Haymow is reinforced so sides won't bulge when it is tightly packed.

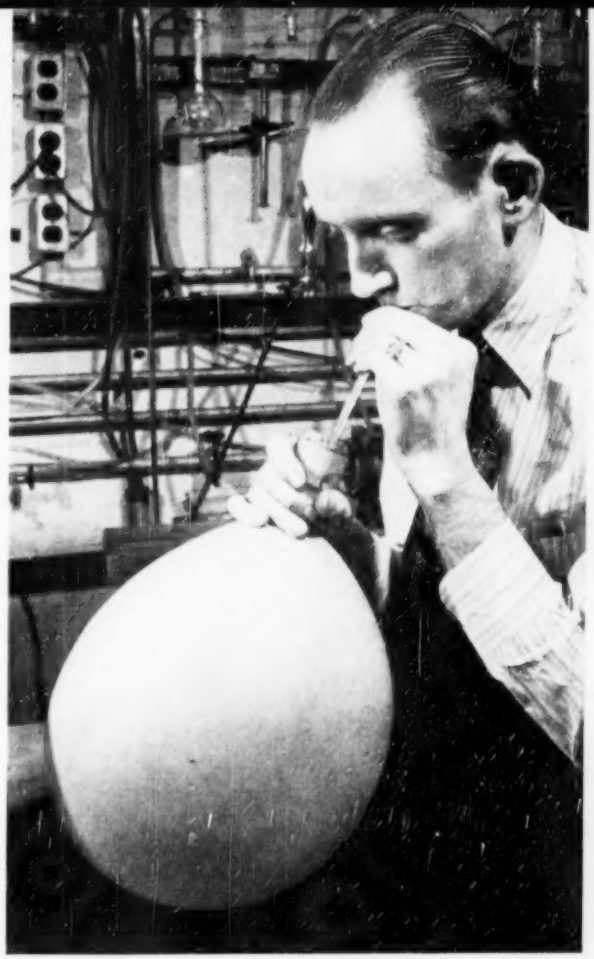
After framework has been raised, carpenters put on siding and finish the roof. According to Gehr, design for barn was brought from Switzerland by early "Pennsylvania Dutch" settlers.



Mr. and Mrs. Levi Zartman inspect the stable of their new barn, raised by neighbors to replace one that burned. The completed structure is 45 feet high, 45 feet wide, 76 feet long.

Hot Breath Sampled For Safety

THIS, literally, is a breath-taking job. To protect workers who handle radioactive materials, the National Bureau of Standards in Washington takes breath samples sent in by private companies and government laboratories and analyzes them for harmful particles. The worker at right is shown breathing into a balloon. His breath is then collected in a vacuum flask, which is mailed in a metal container to the Bureau. There a series of complicated tests determine whether he is inhaling a dangerous number of radioactive particles. If the concentration is too high for safety, such precautionary measures as improved ventilation or rotation of workers are in order. Otherwise, the worker might get cumulative radiation sickness. END



The gallon-sized flasks are tested with a 2,000-volt, high-frequency electrical discharge (left). If vacuum is complete, sealed flask gives off bluish light. Metal mailing containers (center) are tagged with identifying number and date. Bureau's technicians (right) give the final word.

Just TRY to Steal

Thieves get a startling surprise when they tamper with a truck that screams out loud for help.

By C. C. Nash

PS photos by Hubert Luckett

JEWELRY salesman Jack Seide came out of a customer's store to find his car broken into and his sample kit gone.

"Second time in a month," he muttered. "This is getting to be tiresome—and expensive."

So, Seide, having a practical knowledge of electrical equipment and mechanics, made a contraption out of wires, a siren, a handful of triggers and other gimmicks, and a special coded lock. It was crude, but it worked, and the next thief that tampered with Seide's car set off an alarm that sent the burglar away from there at approximately the speed of light.

That was the first Babaco Alarm, devised by Seide in 1931 to protect his samples.

That siren reverberated over a lot of territory. The news soon spread to other salesmen of valuables, as well as to shippers and truck owners. Before long, Seide was out of the jewelry business and in the business of manufacturing truck alarms.

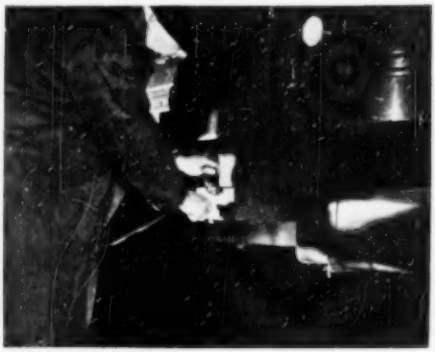
In the 17 years since Seide shifted his occupation, his Babaco alarms have been guardians over some 250 billion dollars worth of truck cargo, without a single dollar lost by theft.

In the same 17 years, thieves have got away with an estimated $200 million in furs, liquor, woolens, cigarettes, and other valuable loot—even kitchen sinks, eggs, construction steel, sewer pipe, and Frank Sinatra records. Not a single one of those losses involved a truck with a Babaco Alarm.

In New York City recently two trucks were stolen in one night from a terminal parking lot. They were the only trucks in the lot that were not Babaco equipped.

If you ever hear the Babaco Alarm shrieking from a truck, you can be sure that the thieving culprit is a novice. Usually he will need only one lesson. The alarm has a

To leave truck, driver must first turn key to proper position in alarm's "brain," mounted on dash, then push right coded buttons underneath. Timer then gives him few seconds to get out.



Siren and battery are mounted in box under body of truck. To open van doors, driver must turn key that temporarily disconnects alarm. If box is jimmied, vibration starts siren going.

This Truck

shriek audible for miles, screaming on for hours until stopped by the truck driver. Tampering with the cab door, a window, any loading door, or even the hood will set it off.

And if a thief thinks he might force a door in spite of the alarm, jump in, and drive off into some hidden side road to unload, he's due for a disappointment. The clutch freezes and the vehicle won't move—until the driver properly operates the coded push-button lock under the dashboard.

A thief may try to remove or break into the siren itself: the vibration automatically sets off the alarm. And cutting the wires won't do any good either. Closed-circuit relays see to this. Breaking one circuit simply closes another, and the siren sounds off anyway.

With few trucks exactly alike in structure, the alarm system is tailored to fit each type. In a typical setup, a box made of tamperproof metal is installed under the body.

This box holds the battery, the siren, and the intricate apparatus that makes it all function. The front of the box opens with a special key (no two keys are alike). And even this has a trigger appliance so that anyone opening it other than the authorized operator will set off the siren.

Trigger connections also are wired into every door, window, or other opening in both cab and body. And under the dash is a series of coded push buttons. Only the driver knows the secret for a silent start.

To neutralize the alarm, the truck driver first unlocks the system with his key. This gives him a certain number of seconds to get into the cab and operate the code buttons. If he takes too long to push the buttons, the alarm goes off even for him. If his timing is right, however, he can drive off or open the truck.

A Year's Workout in a Quarter Hour

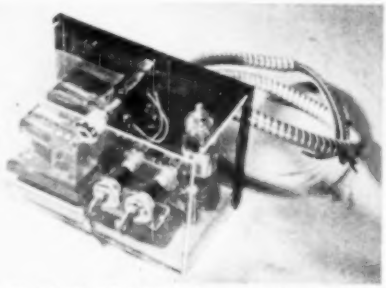
Before installation, every Babaco Alarm and every part of the unit goes through elaborate tests. One testing instrument simulates, in fifteen minutes, all the shocks, jars, and jolts that a truck would get in a year's operation. Another pushes in and out 50,000 times the plungers that govern window, door, clutch, and "parker" controls. A cold test puts every vital part through 30-degrees-below-zero operation; a heat test reproduces scorching desert temperatures.

The alarm systems are leased, not sold. By leasing, Babaco can make certain that its truck alarms will be checked every 30 days by experts in one of its 200 branches throughout the country.

The alarms are constantly being improved to meet new truck conditions and new twists in truck thievery. Long-haul trucks, carrying as much as $100,000 cargo, often arrive at their destinations in the dead of night, too late to be unloaded. They have to stand by, locked of course, until morning. Recently a gang drove up to truck terminals at night with their own tractor units, and towed off parked, loaded trailers. Even the Babaco Alarm couldn't sound off under such conditions, for it was triggered only by tampering with points of entry.

Babaco engineers went to work, however, and almost before the truckers themselves were aware of the new thievery trend, a new gimmick was ready. It was a "parker" alarm, designed to go off not only when tampered with, but also if the vehicle was moved by anyone but its driver. END

To enter cab, driver must shut off system with key, or opening door would set off alarm by releasing push switch set in jamb. Even if thief gets in, clutch freezes and truck won't move.



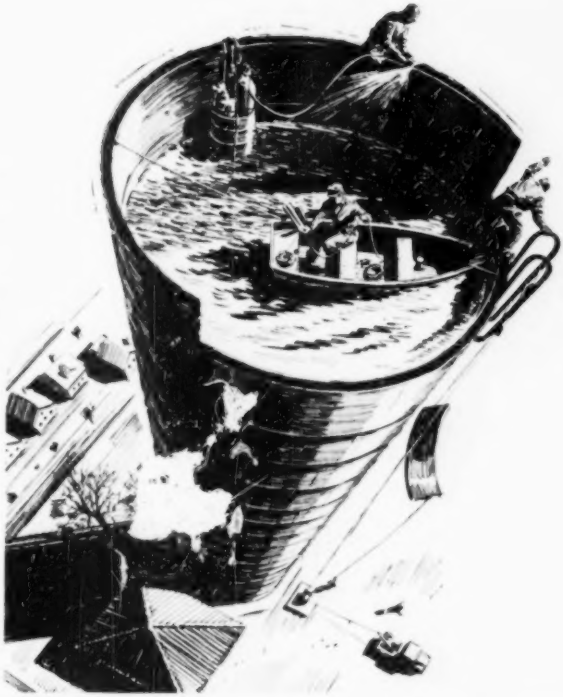
Alarm's "brain," shown here in plastic case, reveals intricate innards. Master key at left is kept by truck's owner, one at right by driver. Box's lock at top can be opened only by Babaco.

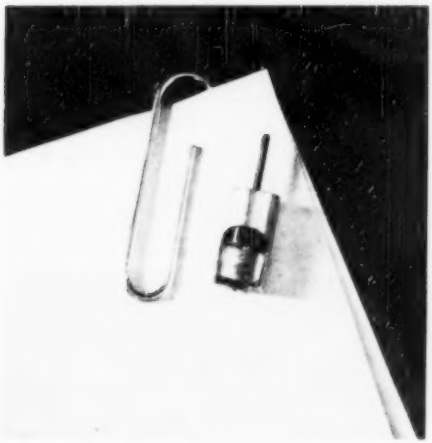
For repairs and inspection, serviceman first opens an outer door. An inner lock then opens a hole through which he inserts screwdriver, as above, to gain access to the siren mechanism.

Tank Razers Work from Rowboat

When salvage workers in Erie, Pa., recently dismantled a steel water tank 125 feet high, they did the job from a rowboat floated inside, instead of the usual scaffolding and bo'suns' chairs rigged on an empty tank. Men and equipment could thus be lowered to a new working level, when necessary, simply by releasing the water inside.

The standpipe was cut away in 1,000-lb. sections by gas torches, and then lowered to the ground, as at right, by cables attached to a hoist that was mounted on a truck. An oil drum hooked to the side of the tank held the gas cylinders that fueled the torches. Ace Junk & Salvage Co. did the job.



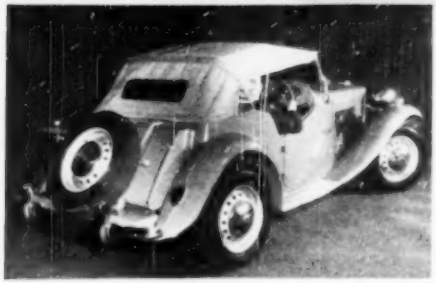


Electric Eye Gets Smaller

Tinier than a paper clip, the tube above, shown actual size, is a new type of electric eye. Called the Phototransistor, it is sturdier as well as smaller than present photoelectric cells. It stemmed from development of the transistor (PS, Sept. '48, p. 117), a device that performs most of the functions of the vacuum tube without requiring a vacuum or a filament supply. Bell Telephone Laboratories developed the eye.

Shovel's Cab Is Air-Cooled

The operator of the electrically powered shovel above keeps comfortable in an air-conditioned cab even while it's handling steel-mill slag at 2,800°. Mounted on top of the cab, the cooling unit supplies 400 cubic feet of air per minute, filtered through fume-removing canisters. Using Freon-114 gas, it keeps temperature inside the cab down to 80°. Dravo Corp., of Pittsburgh, Pa., makes the cooler.



With top up, low-slung M.G. stands 4 ft. 5 in. high. Note deep-cut doors, exposed fuel tank.

M. G. Gets Coil Springs, New Frame, More Speed

Faster and sturdier than its forerunners, this famed sports car now makes its first bid for comfort, too.

By Sheldon M. Gallager

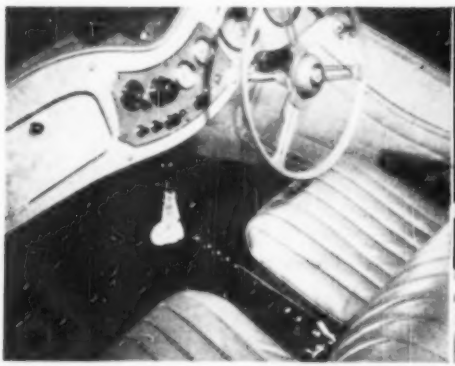
PS photos by W. W. Morris

WHILE most American motorists have been taking a smooth ride for granted for years, the British-made M. G. Midget has been quietly exciting sports-car fans all over the world—without a knee-action to its name. Now, for the first time in its 21-year history, the snappy little two-seater will have independent front-wheel suspension with coil springs.

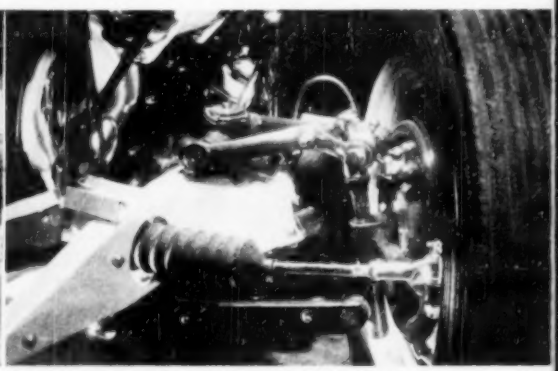
The M. G. isn't backward—just cautious. Its engineers took years to make sure they could come up with a design that would provide the smooth-riding comfort of coil springs without sacrificing the speed, ruggedness, and road-holding ability long expected of the M.G.

The result, except for appearance, is virtually a new car. The softer suspension required a more rigid chassis, so the old channel frame had to be discarded for a sturdy box-section frame. The heavier chassis, however, boosted the car's weight to 2,009 pounds, a 198-pound increase that threatened to steal vital speed. To offset this, wheels were made smaller, providing, in effect, a lower axle ratio. Now, despite the added weight, the same 54-hp. engine gives the new 1950 Midget, designated the TD, a top speed of 83 m.p.h., some 5 m.p.h. better than its predecessor, the TC.

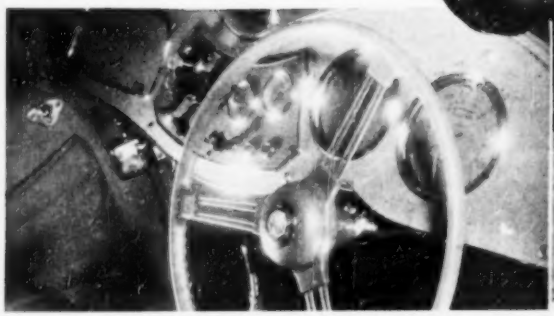
In styling, the M.G.'s long-famous racy lines remain unchanged, except for a body four inches wider that gives greater roominess inside. Increased stability is also provided by a slightly wider track. At high speeds, the new TD will get 27 to 30 miles on a gallon; at low speeds, as much as 42 miles. Price? You can pick one up, delivered in this country, for about $1,850.



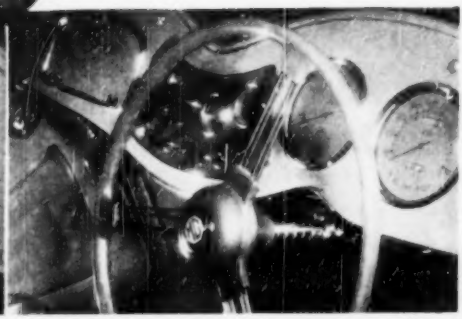
Double-hump dash is unchanged except for regrouping of instruments closer to driver. New one-piece seat back adjusts for tilt. Lever between seats is hand brake. Upholstery is leather.



Independent coil suspension, a sight few M.G. followers expected to see, replaces old hard-riding leaf springs. Coil spring is supported by A-frame pan. Steering is rack and pinion.

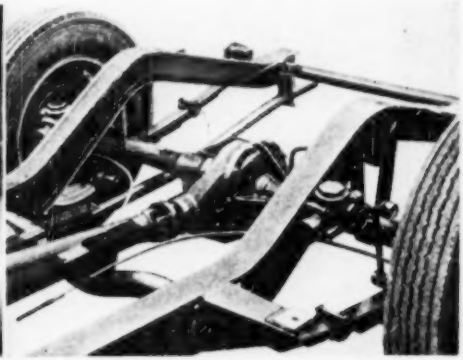


Telescoping steering wheel, shown retracted above and extended at right, permits tailoring car to driver. Car, shown here with right-hand drive, is now available with left-hand drive.

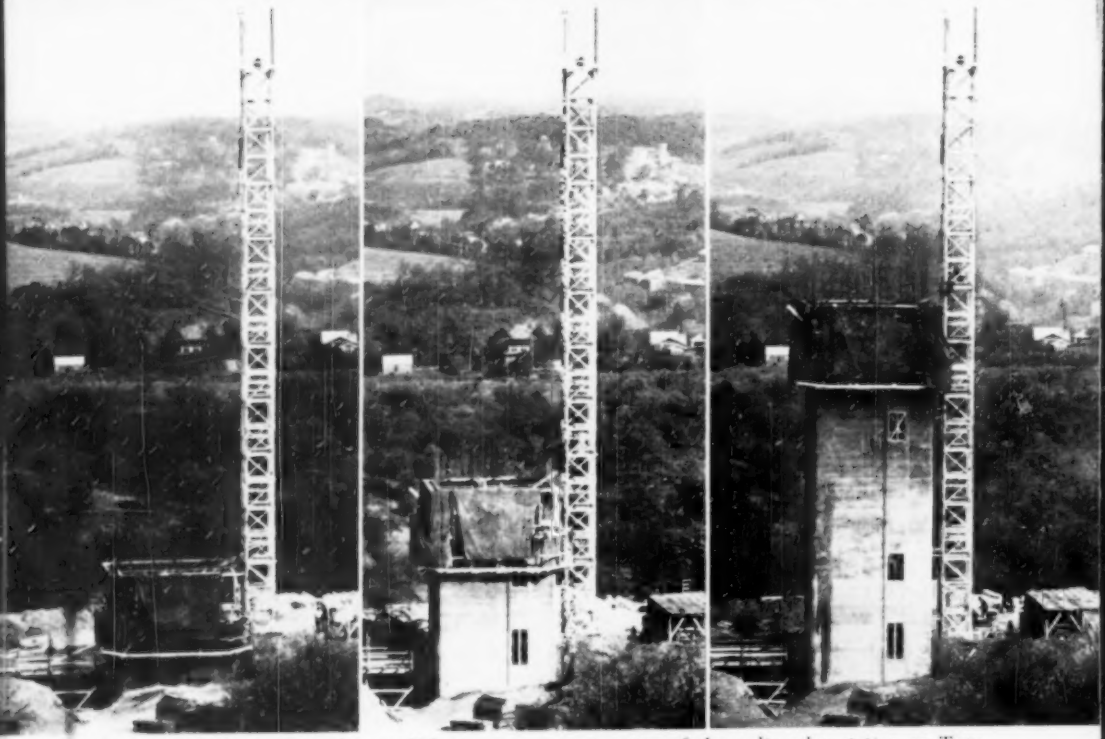


Twin 5-in. dials are speedometer and combined clock and rev counter. Grouped dash controls include horn button. Transmission has four speeds forward; rear axle uses 5.125 to 1 ratio.

Engine is still 4-cylinder, 54-hp., unchanged except for T-shaped air intake connecting dual carburetors with single filter. Note built-in tool chest at left, large 12-volt battery in rear.



New box-section frame is upswept over rear axle to increase ground clearance. Rear springs are leaf, as before, but slightly softer. The wheelbase is 94 in.; over-all length, 145 in.



How a concrete building lifts itself by its own bootstraps is shown in the series of pictures above, made from the same location during the construction of the radio relay station on Troy Hill, near Pittsburgh. The first photograph (far left) was made on a Wednesday, when the build-

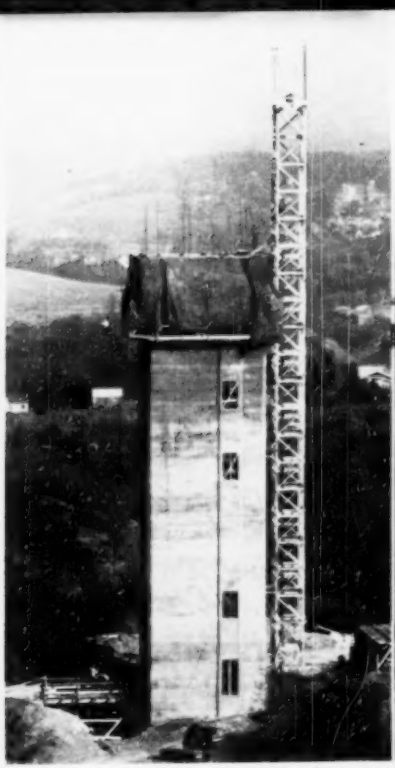
TV Towers Sprout from Sliding Form

TOWERS that were raised by their own bootstraps will be relaying television shows cross-country this fall. Part of A.T.&T.'s New York-to-Chicago chain of radio relay stations, they were built with the help of an unusual wooden form that rises with the structure, sliding up as the concrete in it hardens.

Ordinarily, concrete buildings are poured one level at a time, the forms being knocked apart and reassembled for each higher level. Here, though, the sliding form stays together until the building is finished. It rides on 20 threaded steel rods that make up part of the vertical reinforcement of the structure. Screw jacks on these rods raise the form about six inches an hour. Since the concrete must be poured continuously, work goes on day and night.

The sliding form consists of three wooden frames, two small ones fitting inside the third large one. Concrete poured into the space between the large frame and two small ones makes the outside wall. The space between the two small frames makes an inside wall enclosing the stairs.

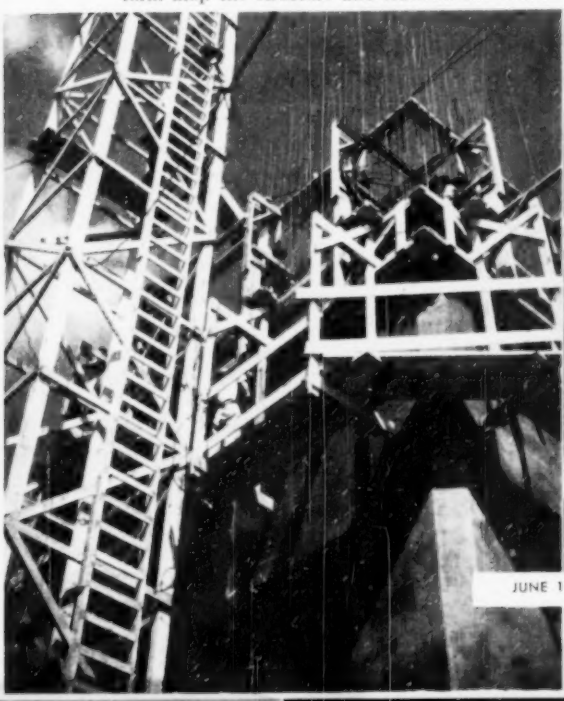
The continuous-pouring method was employed by A.T.&T.'s Long Lines Department for much of the eastern leg of the 31-station New York-Chicago relay chain. While built primarily to relay television shows on its searchlight-like beams of micro-waves, it may also be used to carry great numbers of long-distance phone calls.



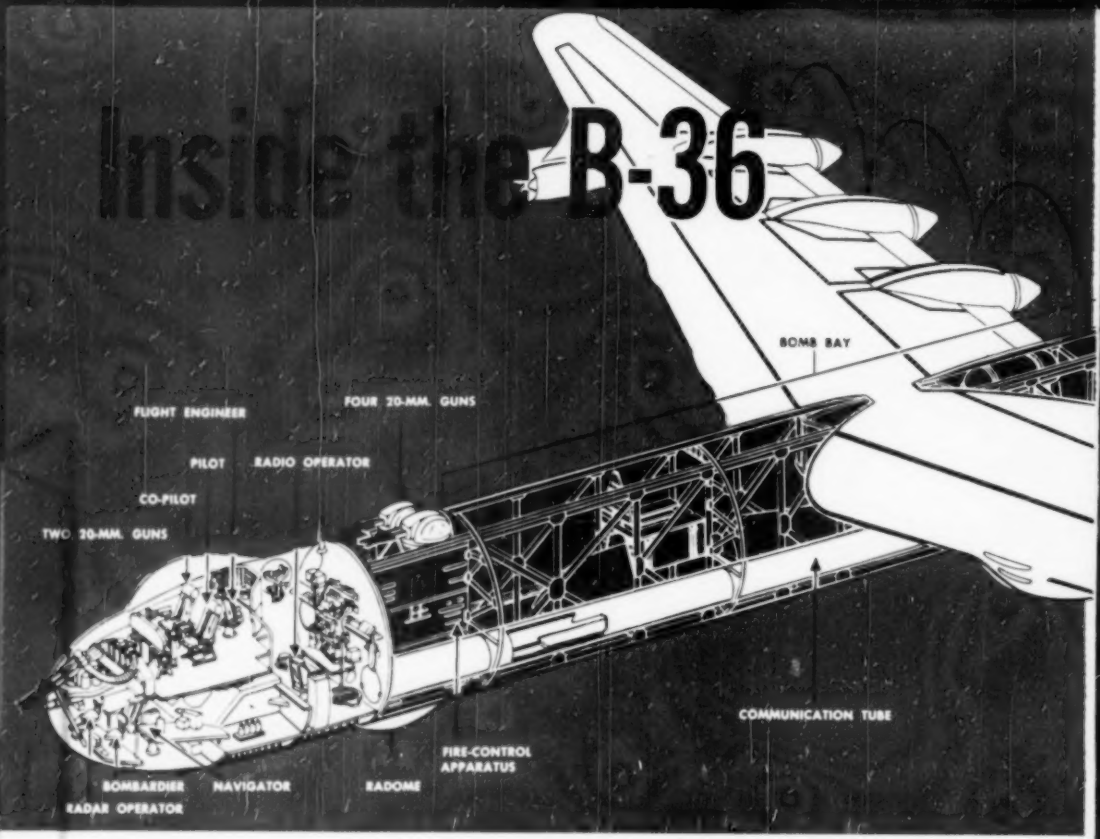
ing was only 16 feet high. By the next Monday (second from right) it had reached its full height of 103 feet. Photo at far right shows the structure completed, but before installation of huge horns that serve as antennas. Tower is one link in New York-Chicago television relay.

Scaffolding hanging from the sliding form supports a "finisher," who smooths concrete as it is uncovered by the form. The workmen's platform atop the structure also rides on the form.

Form rises about an inch at a time as workmen operate jacks fitted to threaded steel bars. Note yardsticks placed behind threaded bars to aid in keeping platform level as it moves up.



Inside the B-36



THIS CUTAWAY gives you your first over-all view of the interior of the Air Force's B-36 intercontinental bomber. Pressurized areas of the 162-foot fuselage are shown in white. Designed to carry 10,000 pounds

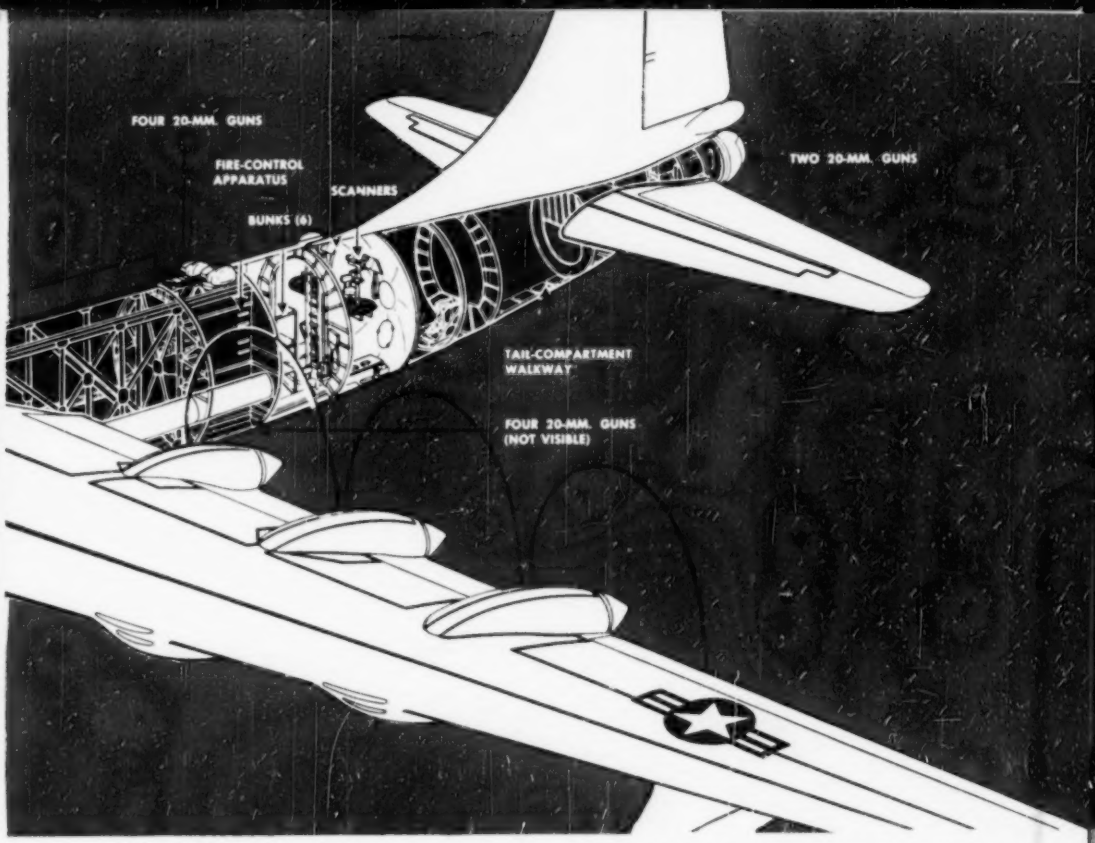
By John F. Loosbrock

BACKBONE of the U.S. Air Force's Strategic Air Command, the Convair B-36 is the world's biggest bomber. Here, for the first time, a cutaway sketch and photographs are combined to give you an inside look at this sky giant.

Its 13-man crew rides in pressurized comfort, even at altitudes up to 50,000 feet. The plane carries its own subway, an 87-foot airtight communication tube, 30 inches in di-

FLIGHT ENGINEER on the B-36 keeps an eye on the bewildering array of gauges and controls that harness the six 3,500 hp. engines. On late models, four 5,200-lb. thrust jet engines give added speed.

FORE AND AFT PRESSURIZED SECTIONS are connected by an 87-foot-long pressurized tunnel. Crewmen ride through it by lying on a four-wheeled cart, pulling themselves along a cable. Cart runs on rails.



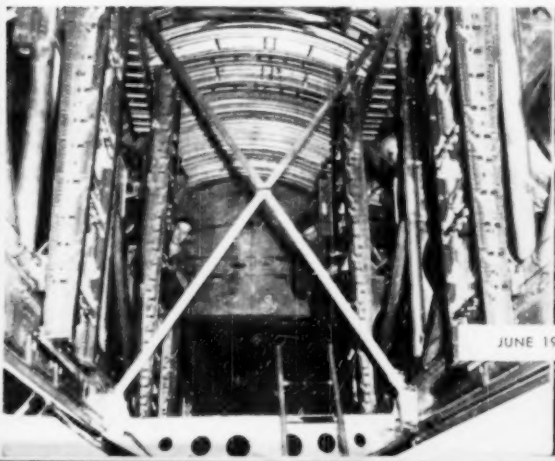
of bombs 10,000 miles, the huge plane can carry as much as 84,000 pounds for shorter distances. For protection against enemy interceptor planes, the big Convair bomber mounts sixteen 20-mm. cannon.

ameter, that connects the front and rear pressurized crew compartments. The rear one has six bunks, where crewmen sleep during long flights.

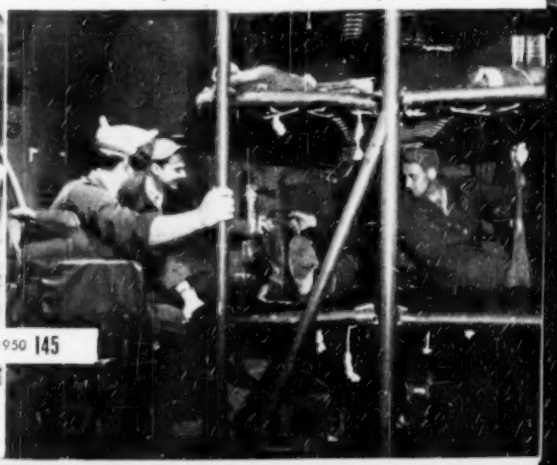
In the air, the B-36's skin is sleek, unbroken by protruding gun turrets. These retract during flight and are elevated when the bomber reaches hostile territory.

The big bomber's sixteen 20-mm. cannon are mounted in eight turrets, fired remotely by a GE central fire-control system. And future experiments may replace these guns

PHOTO SHOWS two airmen working on part of the intricate equipment in one of the bomb bays. Bays have retractable doors that slide up inside fuselage, instead of dropping down, when opened.



DURING FLIGHT, crew members stand by at their stations in rear section. Scanners, with earphones, watch for trouble that pilot might not see. Off-duty crewmen can nap on the six bunks in compartment.

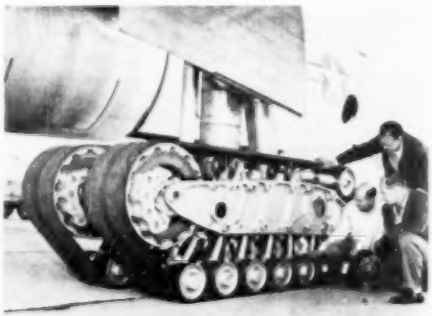


IN THE NOSE, directly beneath the pilot's compartment, sit the radar operator, navigator, and bombardier. Under new USAF training program, any of these men can handle duties of other two in emergency. Above them, just in front of the pilot, two of the plane's sixteen 20-mm. cannon are mounted.

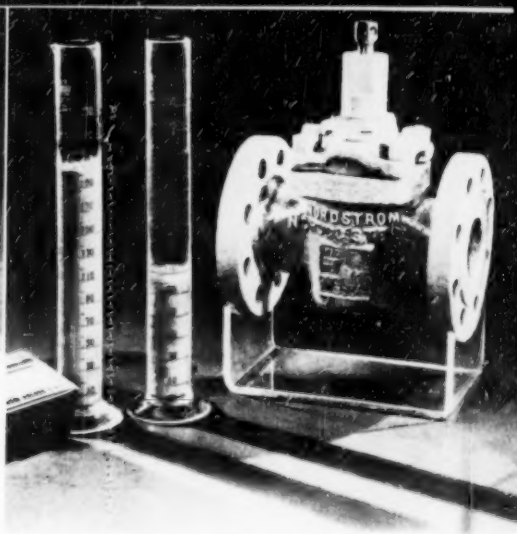
with rocket launchers, putting bomber-fighter tactics in a new light.

Also on the books, as part of the campaign to make the B-36 Superbomber faster and more deadly, are drastic design changes. Wings would be swept back sharply and turboprop engines would replace the present reciprocating, pusher-type. This would enable it to exceed its present announced top speed of more than 435 miles per hour. END

THIS PHOTO SHOWS airman checking a portion of the maze of wiring that is interlaced throughout the bomber's fuselage. Unpressurized areas such as this are inaccessible during high-altitude flights.



LATEST EXPERIMENTAL ADDITION is tracked landing gear. Weight rests on bogie wheels that roll on two endless belts. This spreads weight over greater area, so plane won't sink in soft runways.



New Grease Is Compressible

SEEMINGLY contradicting textbooks that say liquids are incompressible, lubricant in the sticks of grease above can be compressed under pressure. Graduated receptacles compare amount of new Rockwell Hypermatic lubricant (left) and of a standard lubricant that can be squeezed into valve at far right. Pressurized, the new type becomes self-feeding, and automatically lubricates valves designed to use it. Entrained gas partly explains its compressibility, the maker says; the rest is his trade secret.

Glasses Dim Sun to Taste

ADJUSTABLE sun glasses, shown below, become darker or clearer to suit the light when you move a pair of metal control tabs beneath the unbreakable-plastic Polaroid lenses. Each lens consists of front and rear light-polarizing elements, the front one fixed and the rear one rotated through 90° by the tab. According to their relative position, any desired graduation between transparent and opaque is obtained.

Hot Cargo Rides Wing Tips

SPECIAL compartments built into a plane's wing tips safely transport radioactive isotopes manufactured in Britain's atomic pile at Harwell, England. Except for carrying the isotopes to and from the plane, the heavy, lead-shielded containers, required when the "hot" materials share cabin space with passengers and cargo, are no longer needed. Below, a shipment is loaded with tongs for delivery to South Africa.

How They Make Your Cups and Saucers

The potter's wheel has been motorized, but mass production of modern American chinaware still takes skilled hands.

By George H. Waltz, Jr.

PS photos by W. W. Morris

IF YOU happened to overhear a group of men talking about such things as "biscuits," "mixers," "cakes," "saggers," and "jiggers," no one could blame you if you thought they were bakers. But you'd be wrong. If you asked them what sort of work they did, they'd tell you they were "pot makers." If that one stopped you, and you asked again, they probably would explain that "pot makers" was just a short name for pottery makers, and that they worked in a plant turning out china plates, cups, saucers, and other tableware.

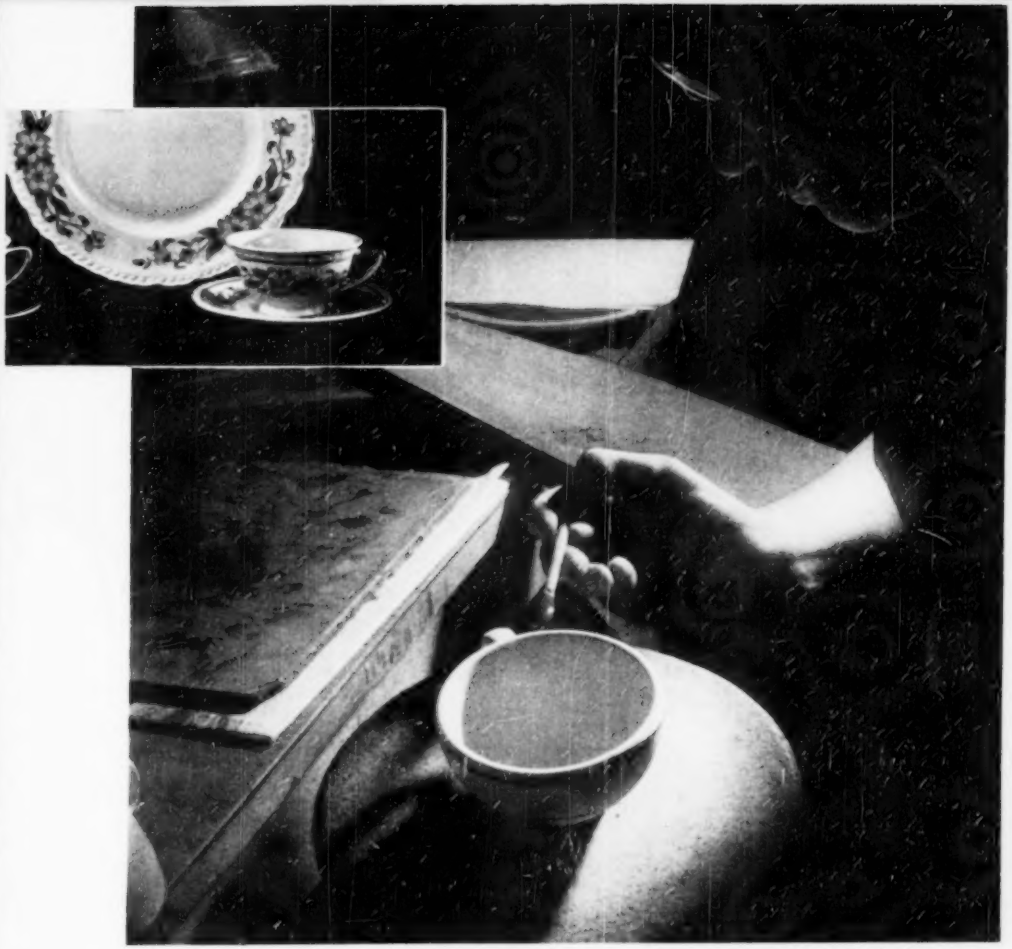
PS photographer Bill Morris and I were introduced to the quaint jargon of the pot makers recently when we visited the Jackson Vitrified China Company's plant in Falls Creek, Pa. We learned that "biscuits" and "cakes" weren't edibles, that "saggers" didn't sag, and that "jiggers" weren't dancers or small glasses. We also learned that although modern American china may be formed on mechanized potter's wheels, be fired in a modern continuous gas-fired tunnel kiln, and get its outer coating of glaze on an automatic glazing machine, the process still requires the skilled hands of many workmen.

The china dishes that your wife sets out on your dining table three times a day started out in life as a carefully blended mixture of clays, feldspar, flint, and water. Pot makers like to compare the mixtures to the human body (they even call it "body") with the various clays forming the flesh, feldspar the muscles, and flint the bones. Although each manufacturer has his own secret formula, the differences are largely a matter of proportions.

Oddly enough, in any one china plant the same cent-and-a-half-a-pound mixture that goes into making thin dinnerware for the home also is used in producing the heavier and less expensive ware for hotels and restaurants. The difference in cost lies in the increased difficulty in making the finer cups, plates, and other dishes *thin*, and in their decoration.

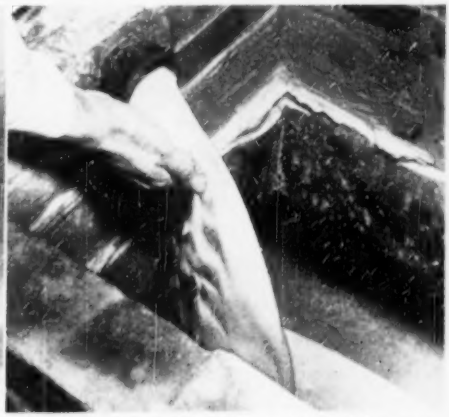
Basically, there are five main steps in the manufacture of china—preparation of the body mixture, shaping, drying, firing, and decorating and glazing. Cups, saucers, plates, and other simple forms are shaped by "jiggering" the plastic clay mixture into molds on a motorized potter's wheel. More complicated forms, such as gravy boats, are cast in multipart molds.

Careful firing is one of the secrets of good china. Firing in a modern tunnel kiln is a continuous 24-hour-a-day process. The china, still in its partially dried clay state, is placed in fire-resistant receptacles called "saggers," which in turn are stacked on kiln cars. The cars are loaded into the entrance of the kiln at proper time intervals and a hydraulic plunger pushes them along. As each car leaves the kiln's discharge end,

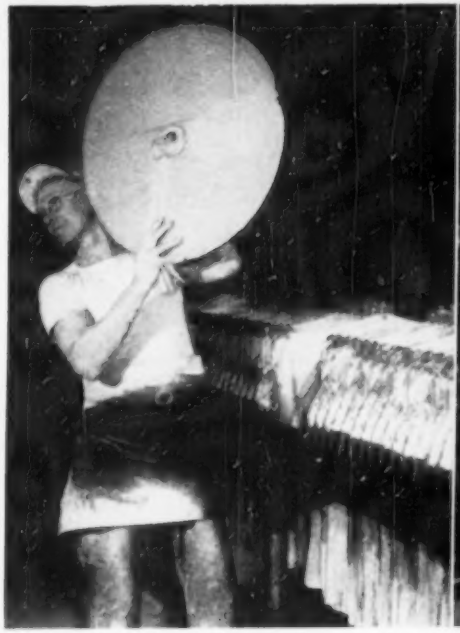


In hand painting stripes on a china cup, worker places it on a turntable, which she rotates.

1 Body mixture for American china consists of clays, feldspar, and flint. Each ingredient for a batch is carefully weighed out and shoveled into gigantic, motor-driven mixers.



2 Water is added to the mixture. After careful blending, the mixture is passed through fine screens to remove any coarse impurities. In this state, the mixture is called "slip."



3 From storage tanks, the slip is pumped under pressure into filter presses, which press the excess water out of the slip and form the body mixture into large disklike "cakes."

4 The cakes then are worked and kneaded in a pugmill. The mixture is blended, compressed, and forced out through a nozzle to form sausagelike slugs. This is called "pugging."

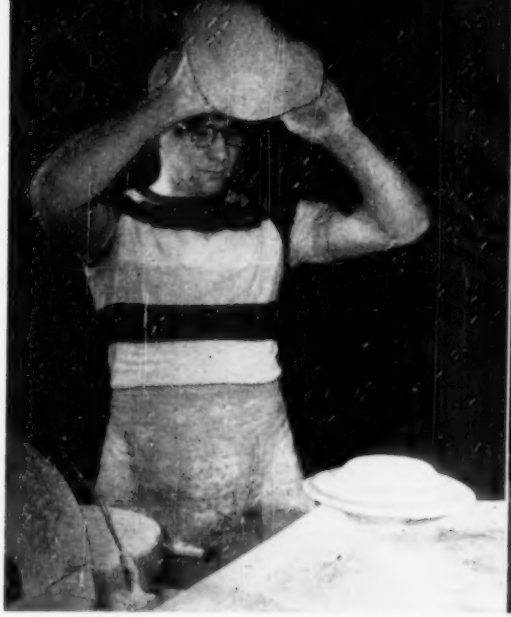
6 Jiggering. The mold with its bat then is placed on a motor-driven potter's wheel, where a steel profiling tool mounted on a hinged lever shapes upper side of the bat.

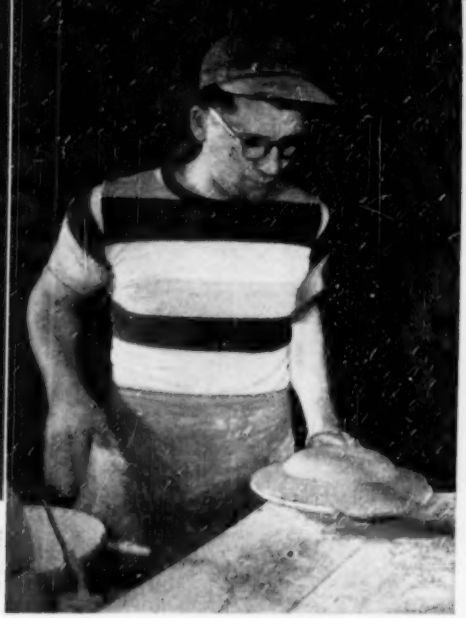
7 Machine jiggering. Small-size plates also can be shaped on semiautomatic jiggers. Molds with bats, placed on machine's spindles, are shaped and trimmed automatically.

a new car is pushed into the loading end.

During its slow progress through the kiln, a number of physical and chemical changes take place in the body mixture. First of all, the remaining water is driven off. Then, as the temperature increases toward the maximum, the feldspar begins to fuse, and the clays start to decompose to form a new silicate. The latter crystallizes into tiny needlelike structures, and the flint begins to dissolve. In effect, a glassy matrix is formed within the material. As a result, the clay-state cup, saucer, or whatever that entered the kiln fragile and porous, leaves it strong, dense, nonporous, and nonabsorbent.

Strangely enough, the decorating end of the china industry was one of the first to feel the repercussions of the A-bomb. Before the war, a material known as uranium oxide was used to produce yellows. Vanadium oxide is now substituting for its more famous brother.





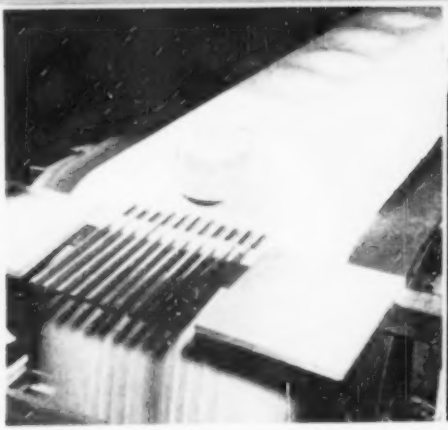
5 Batting out. This is first step in the actual making of a cup or a plate. A lump of body mixture is placed in the machine visible in lower left-hand corner of photo above, and pressed into a flat pancake or bat. The worker then picks up the bat, raises it up high, and slaps it down hard on a plaster-of-Paris mold of the particular piece to be formed.

8 Cups are jiggered out in much the same way as plates. However, they must be finished on lathes. Because the body mixture contains flint, tools must be sharpened frequently.

9 Handles for cups are cast separately and, after being trimmed by hand with a knife to fit the double curves of the cup, are cemented in place with liquid body mixture.

10 Molds used in jiggering and casting have comparatively short lives. As a result, the casting of replacement molds in plaster-of-Paris master molds keeps the molders busy.

11 Intricate pieces, like gravy boats, cannot be jiggered, but must be cast in multipart molds. Body mix is made liquid for casting by using chemicals that add a little water.



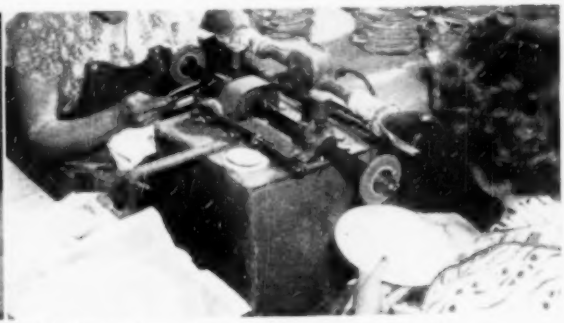
12 Plates, like all ware at this stage, are fragile. To keep them in shape during firing, sand, or similar material, is placed between rims. This is called "bedding."

13 Before firing, the ware, still in its fragile clay state, is placed in fire-resistant containers called "saggers." The filled saggers then are carefully stacked on kiln cars.

16 Shrinkage. The cup at the top is still in the clay state before firing. The cup at the bottom has been fired. Shrinkage from molding through firing totals 12½ percent.

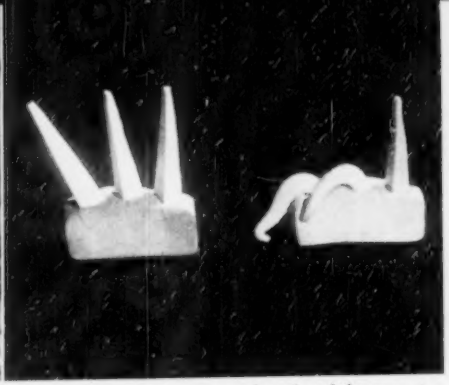
17 Biscuits, as fired pieces are called, are so tough that they can be smoothed down by tumbling them in long motor-driven drums partially filled with broken pieces of china.

20 Machine glazing. Some pieces can be machine glazed. Dishes are rotated automatically while battery of spray guns spreads on the liquid glaze. This glaze also is fired.



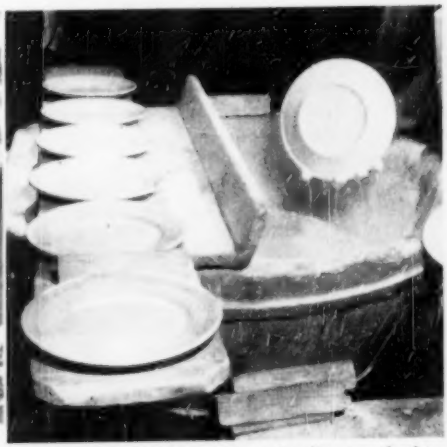
21 Finishing. Any slight imperfections in the glaze, such as marks caused by the pins used to support the plates in saggers during glaze firing, are removed by grinding.

14 Into the tunnel kiln for 65 hrs. of firing. As cars progress through kiln, ware is subjected to rising temperatures until about 2,200° F. is reached. Then it is cooled.

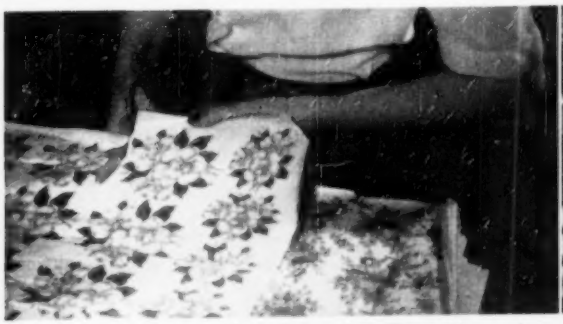


15 Pyrometric cones placed on kiln cars give a double check on recording pyrometers in control room. Melting of cones, as at the right, indicate maximum temperature reached.

18 Underglaze decoration. Decorations using metallic oxides that can stand high heat can be applied before piece is glazed. These are printed on with lithographic transfers.

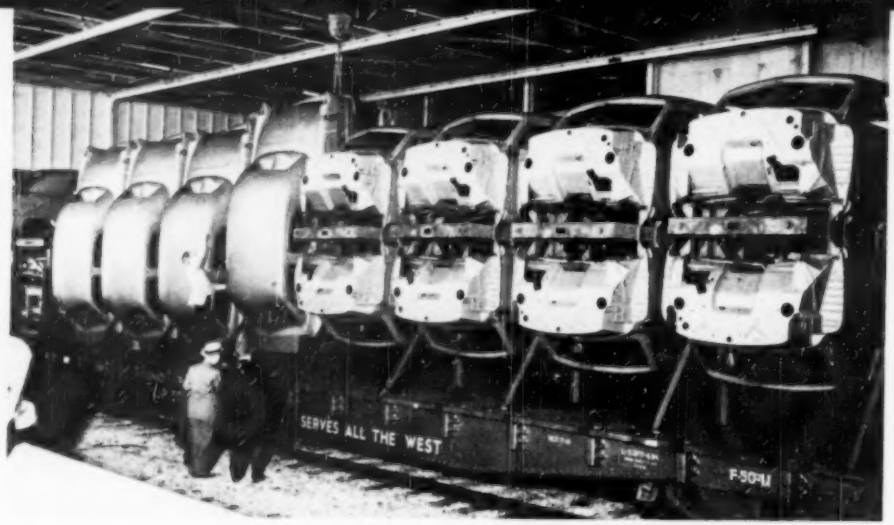


19 Hand glazing is done by dipping the biscuit into a glaze solution, which is a form of glass. Pieces then are fired at 2,000° for 24 hours or more to melt the glaze.



22 Overglaze decoration. Decorations using metallic oxides that cannot stand high temperatures are applied over the glaze and fired separately. Decalcomanias do the trick.

23 Gold edging and stripes are applied by machine. After firing, the gold is burnished to a high luster by hand with a burnishing stick made up of tiny glass fibers.



Flatcar Upends Auto Bodies

A SPECIAL mounting on the flatcar above allows auto bodies to be locked in pairs, belly-to-belly, like the eight shown at right. Then the mounting device "pinwheels" them so that the bodies will ride vertically, tail end up, like those at left, with their noses protected. In this way twice as many cars can be carried as in a conventional auto boxcar. The system was devised by Union Pacific and Kaiser-Frazer engineers.

CO_2 Triggers Extinguisher

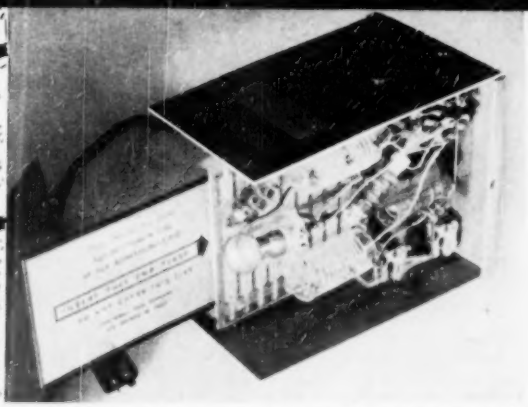
THIS new stainless-steel fire extinguisher doesn't have to be recharged from time to time as do the soda-acid ones. Only after use does it have to be refilled with water, as at left, and a new CO_2 cartridge inserted. To use the Pyrene extinguisher, it is turned upside down and banged on the floor. This releases the CO_2, forcing out a 40-ft. stream of water.

Sprayer Carries Own Power

THE compressor goes right along with this compact spraying outfit. Electrically operated, it has a nozzle pressure of at least 25 lb. per sq. in. Offenbach and Reimus, San Francisco, makes the Spraymaster.

Twist Puts on the Squeeze

THE turn of a cap on the bottom of Twistube, shown at right, squeezes a flexible plastic sack inside a hard container. And out of the top oozes just the right amount of toilet cream or paste. Among advantages of the new gadget, made by the General Cap and Container Corp., of New York, are that the outside cylinder always retains its original shape, and every bit of the contents can be squeezed out.



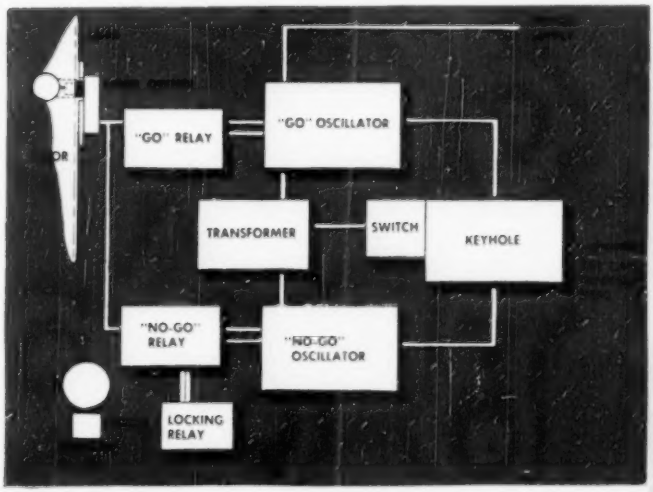
"Radar Lock" is mounted in steel box that fits inside house wall. It uses one twin-triode "peanut" vacuum tube, which is always kept warmed up. Snap-action switch turns on full power for tube when key card is inserted. Small bulb merely illuminates the key slot.

Card Opens Electronic Lock

IT LOOKS like an ordinary wallet-size identification card. You slide it into a slot near the door—and the door unlocks! The card is a key; the slot, an electronic lock.

One of the inner layers of cardboard that make up the key has several strips of graphite. If these strips are the same pattern as strips of silver inside the lock, the door opens. But if someone tries the wrong key—or a sheet of metal—the door stays locked.

The silver strips in the lock form one plate of an electrical condenser. The graphite strips in the key form the other plate. The capacity across the two plates loads a vacuum-tube "Go" oscillator, drawing current and tripping a relay that controls a standard electric door latch. If anything but the right key is used, a different "No-Go" oscillator is loaded, tripping a relay that breaks the connection to the latch. END



Block diagram shows components of lock made by Electronic Lock Co., Hollywood, Calif. At far right are key layers—from top down: outside sections, sheet with graphite strips, lightproof paper. Lock can be set so wrong key sets off a burglar alarm.

Unaware of impending disaster, miniature logging train races toward mined trestle, while three cameras follow action. Tracked camera in foreground dollies in and out like pro rigs.

For movie, logging train rolls along 200 feet of 8-in. track, with wooden rails. Each flatcar rides on eight 3-in. plywood wheels. Here Maker is adjusting tiny chains holding logs in place.

Real logs would be too heavy a load for trestle, so hollow ones are made by tacking 1/16-in. chip board around circular end blocks, painting it brown, and then gluing on shavings for bark.

He Builds Thrills Into Home Movies

By Andrew R. Boone

HOLLYWOOD has nothing on home-movie hobbyist Ray Maker. When it comes to creating realistic scenes and unusual effects, he can give the dream-merchant professionals a run for their money.

For the past 15 years, Maker has been calmly turning out feature-length western thrillers from the pint-sized basement studio of his Oakland, Calif., bungalow. His total to date is an even dozen 50-minute sound films, most of them in color.

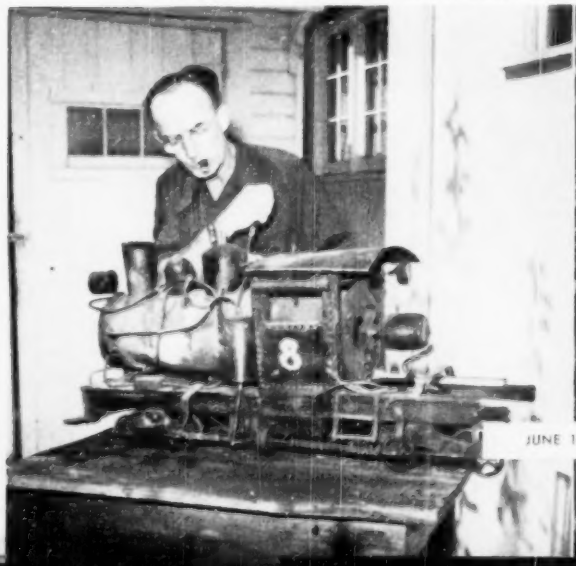
Gimmicks make his movies, and Maker makes the gimmicks. For one picture, a saga of the timber country, he built a miniature steam locomotive, seven log cars, and 200 feet of track and trestle—then promptly blew them all up to make one of the movie's exciting scenes. This was only the beginning. To change a barren, rock-quarry setting into real timber country, he had to transplant 30 small pine trees from a mountainside 100 miles away. Even the logs had to be specially made—real ones would have been too heavy for the frail trestle.

But Maker isn't content with outdoor scenes and long-distance shots. He likes to vary these with close-ups and interior scenes. For these he moves into his cramped basement. Here, squeezed within its narrow walls, are a small stage, cutting room, glassed-in projection booth, and assorted cameras, lights, scenery flats, sound-recording equipment, and special-effects gadgets. Six cameras give Maker a wide range of views and effects. To carry the current load of his lights, additional lines are brought in from two neighbors' homes.

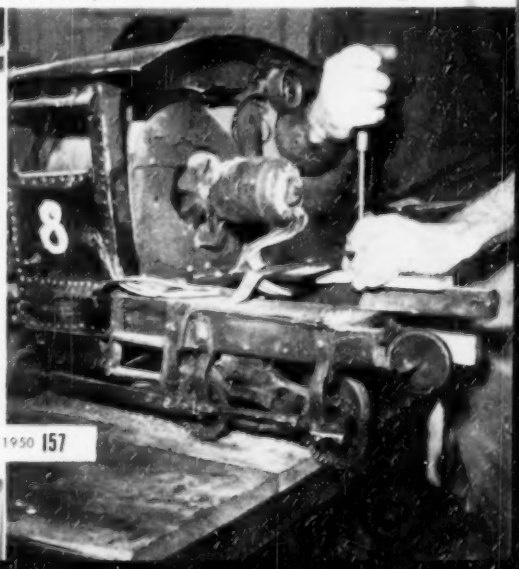
A car-top maker by trade, accustomed to working with his hands, Maker has become expert at turning simple materials into eye-defying props. For the logging picture, he built a full-scale replica of the locomotive's cab out of wood and cardboard. Then he started his cameras, jumped into the seat, and spent several seconds peering intently down a track that wasn't there. A view of the swaying tender and log cars in the background, projected onto a screen behind him, completed this dramatic close-up.

In one movie, a courtroom scene re-

Model locomotive, patterned after Shay type used in logging, is 40 in. long, weighs 75 lb. Boiler develops 15 lb. of steam. Heavy black smoke is made by burning oil-soaked waste.



Small auto-heater fan, powered by 6-volt battery, acts as blower to force draft in firebox. Egg-beater gears on side are dummy drivers, turned by belt from motor underneath engine.



For close-ups showing villains planting powder to blow up train, Maker built nearly full-scale trestle 20 feet long. Actual explosion was light charge with chemicals to make smoke.

Imperiled engineer peers out from wood-and-cardboard replica of locomotive cab built in Maker's basement. Movie of lurching tender and cars is projected onto screen behind him.

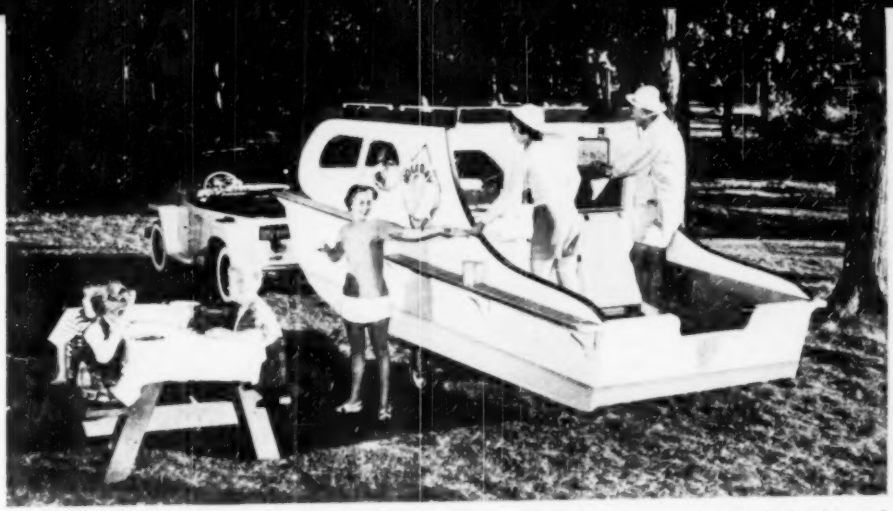
For another movie, Maker rigged up interior of railroad car patterned after old Virginia and Truckee coach. Part of controls for sound-recording equipment can be seen in foreground.

Three seats and painted flats are only props used to create illusion of old-type coach, but they do the trick. Door in background is just knob, but sound camera will pick up its click.

quired that the judge be at one level, the prisoners at a lower level, and the spectators at a still lower level. Building a three-level stage under the low, 6½-foot ceiling would have been impossible. Maker solved this by having the judge sit high, the prisoners kneel, and the spectators sit on the floor.

In another picture, three seats and some painted flats made the authentic interior of an old-time railroad coach. The countryside flashing past the windows was a movie projected onto a screen in the background. Offstage, a burly assistant jumped up and down on an inflated air cushion connected by tubes to air bladders under the coach seats. The passengers jounced realistically. Whistle toots and wheel clicks, recorded months earlier, were picked up from a nearby wire recorder.

Many of Maker's gimmicks come straight from Hollywood, and what he can't duplicate he improvises. By combining mechanical tricks with creative know-how, he can do most of the things the professionals can do—and sometimes better, say his enthusiastic audiences of friends and local clubs.

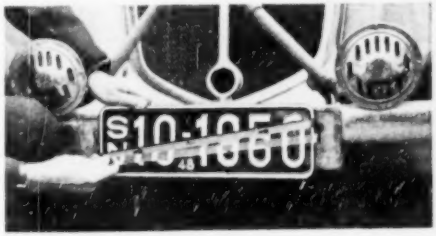


Cruiser at Home on Land or Sea

PICNIC base ashore or a fishing trip on the lake is all the same to this 16-ft. outboard cruiser. Built-in retractable wheels enable it to be towed behind the family car as a house trailer, complete with bunks and galley. The bonded-plywood hull has a flat, double bottom for easy launching and beaching. The American Standardized Building Corp., Chicago, makes the Holiday to sell for around $1,000.

Jig-Saw Plate Traps Auto Thief

SHOWN at a German inventors' fair in Munich, the license plate at right was invented by Ernst Descher to trap auto thieves. After parking, the owner would remove a thin section running diagonally across the number. Result: a "cancelled" plate that police could easily spot should a thief decide to take a spin around town.



It's a new kind of clothespin, made of springy plastic. To clip laundry to a line, you pull open overlapping section of ring by squeezing the triggerlike crosspiece toward the opposite side of the rim with forefinger and thumb. Jiffy-Grip sells at 49c for two dozen.

Sprayed "Skin" Protects Paint

A RUBBERIZED plastic coating protects the newly painted surfaces of instrument panels at the East Pittsburgh plant of Westinghouse Electric. Applied with a spray gun on the production line, the transparent covering prevents dirt and scratches during shipment and installation. It's then peeled off like a banana skin, as seen below, leaving a "factory-fresh" appearance.

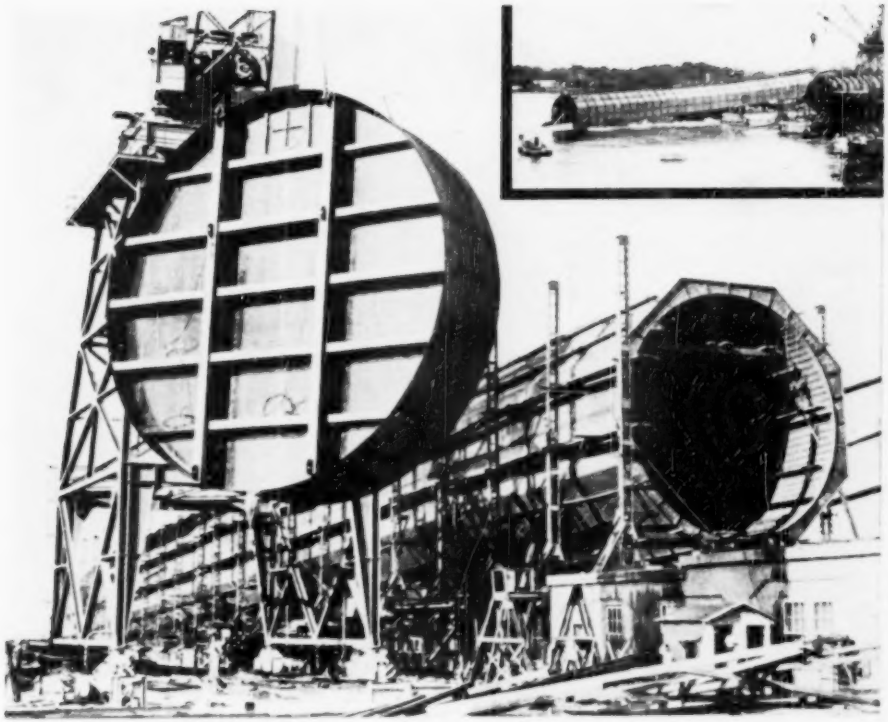
Camera (left) and viewing monitor (partly disassembled to show color disks) are main parts of Du Mont wired color system. Additional, larger viewing screens can be connected to monitor.

Industry Gets Detailed TV Color by Wire

A COLOR television system that retains all the fine detail of present black-and-white TV has been developed for industrial use by Allen B. Du Mont Laboratories. It cannot be used for broadcasting, however.

The Du Mont system uses spinning disks in the camera and receiver to provide a rapid succession of red, green, and blue images that fuse into a full-color picture. This is similar to the proposed CBS system. But since the Du Mont pictures are carried only by wires, they need not be coarsened to keep the frequency band down to the FCC-set 6-mc. limit, as must broadcast color TV. The new system, which uses an 18 mc. band width, is expected to find wide use in showing operations—color helps distinguish details of a surgeon's work.

Bringing fashion shows to customers on many different floors of department store is one proposed use for new system. Monitor (far right) shows what customers would see on big screens.



Tunnel Launched Like Ship

THAT's not a new kind of ship on the ways —it's a tunnel. Four of these 375-foot steel tubes form the Washburn Tunnel under the Houston (Tex.) Ship Channel. Above, a bulkhead swings into place to seal the end before the section is launched (inset) at Pascagoula, Miss., floated to the site, sunk in a trench, and embedded in concrete.

New Chemical Kills Fire Fast

A GASOLINE-SET fire of electric wiring was put out in less than a second by the new chemical being demonstrated above. Army Engineers say it is twice as effective as carbon tetrachloride and cheaper because so little is needed to put out a fire. Called bromo-difluoro-methane, it can be sprayed from a standard fire extinguisher.

Helmet Gives Rear View

RIVALS trying to overtake Pete Rannie, British motorcycle racer, won't catch him unawares. To keep an eye on what's behind him, as well as what's ahead, he has devised a rear-view helmet. Now, without turning around, he can watch his trailing competition through a mirror conveniently mounted on brackets attached to his headgear.

Home of Russell R. Ferrer has cinder-block floor. Concrete was poured between blocks.

A nailable cinder block has furring strip molded as part of the block. Wallboard is nailed right to block instead of using wooden furring strips.

Cinder Blocks

A new type of block, plus new

By Denis Sneigr

PS photos by W. W. Morris

RECENT developments in cinder blocks are stepping up home construction.

A new type of block has a furring strip molded as part of the block—eliminating wood furring strips to support wallboard. Another new angle is the use of cinder blocks as floors. Here they sometimes have a double purpose—the holes in the blocks serving as conduits for forced hot-air heating through the floor.

In the home of Russell R. Ferrer at East Patchogue, N. Y., described here, the blocks were used as an ordinary floor—laid on temporary forms at the first-floor level over a basement. The blocks were put down with a 4" space between each row of blocks. Two ¾" steel reinforcing rods were set in each 4" channel and concrete poured in. Then a 2" mixture of cement and cinders was spread over the entire surface to form the floor of the house. This was kept flooded for a week to keep it from drying too fast. After the cement had set, the shoring beneath the floor was removed and later used as attic framing.

The basement walls are concrete blocks and the upper walls cinder blocks. Plastic

Cost of finished house—less accessories—was $10,870. Only parts on exterior of house that will ever need painting are the wooden gutters and leaders. Windows are aluminum.

Speed Home Building

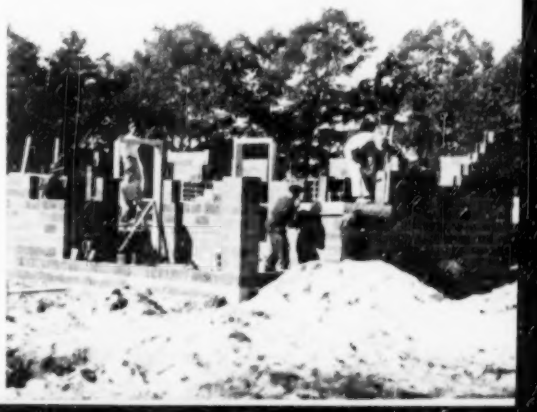
uses for standard blocks, are helping lick housing shortage.

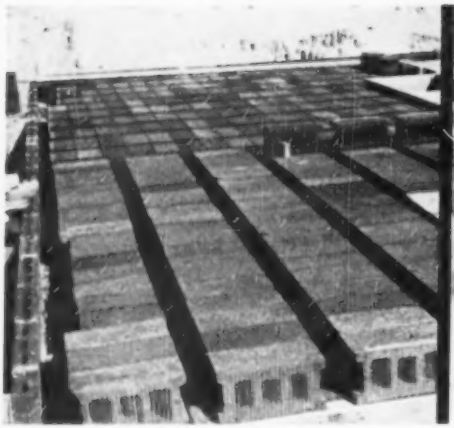
cement was coated on the outside of the basement walls and inside the cinder-block walls to waterproof them. The outside of the upper walls was coated with stucco.

To cover the cement-cinder floor, inlaid linoleum was used in the two bedrooms; asphalt tile and carpeting in the living room; ceramic tile in the bath; and rubber tile in the kitchen.

The spacious basement houses a four-car garage, a big storage closet, a utility room, and another room for a shop and darkroom. The house has four rooms and a dining alcove—a total of 1,360 sq. ft. of floor space, including the 7'4" by 13'8" porch.

Walls went up fast after floor was finished. Photo below—looking toward front porch of house—shows door frames set in place as cinder blocks are laid around them.





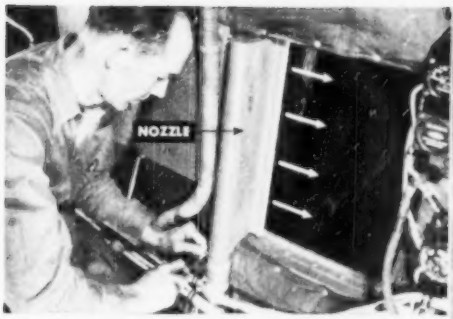
Close-up shows details of floor. Steel rods were laid in channels between blocks. Mesh on end blocks kept out cement-cinder mixture.

View from underside of floor after shoring was removed. Wood grain and knots in shoring left their imprint in cinder-cement mixture.

To waterproof walls, plastic cement was used inside and out. Then outside walls were finished with coating of red stucco cement.

Stainless-steel molding trims all interior doors. Base of two-part molding is screwed to wall. Outer part is then snapped on over base.

House is fireproof, rotproof, and bugproof. Window sash and frames are aluminum. Photo at left shows window when house was partially completed. At right is same window after house was completed. Interior walls are finished with wall board and covered with wallpaper.



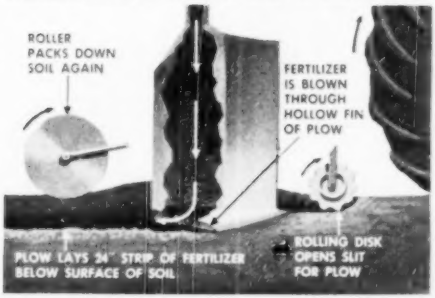
Aerial-Camera Ports Heated

Hot air keeps the seven optical-glass camera ports of Boeing's new B-50 photo plane free of moisture and ice. From a narrow slot in a nozzle by each window, preheated cabin air flows across the inside face of the pane (arrows). While a camera takes a picture, upper right, the flow stops automatically to avoid optical disturbance.

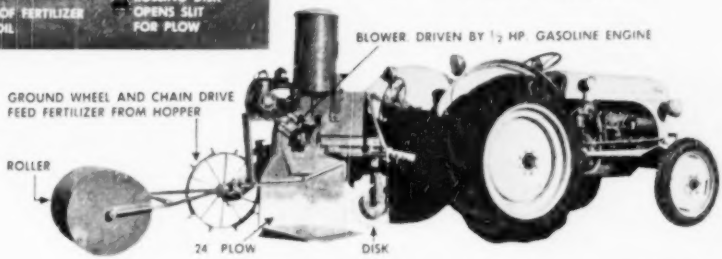
Keeps Your Pencil Sharp

Any pencil becomes a mechanical one when the sharpener at right is kept on its end during use. A twist of the gadget instantly renews a worn-down point. The handy accessory also has a metal sleeve that encloses the lead, protecting it from breaking. It was invented by Frank J. Bambach, a metal-lathe operator, of Miami, Fla.

Machine Buries Fertilizer Without Disturbing Soil



Up to half a ton of fertilizer an acre is laid eight inches below ground by the new subsoil plow and fertilizer distributor shown here. Developed by Hutchens Implement Sales Co., Lamar, Mo., the machine enriches pasture and row-crop land without disturbing the top soil to expose it to erosion. A ½-hp. blower ejects the fertilizer through a hollow plow, a metal fin open at the rear, as shown in the simplified diagram.



Result of the remodeling job shown in the pictures on the next two pages is the girl's Gay Nineties umbrella above. The man's cane is actually a telescoping holder for his umbrella.

How Experts Put New Life in Old Umbrellas

An 84-year-old umbrella-repair shop shows how its workers can rebuild a beat-up bumbershoot into a new one.

By C. Ennis

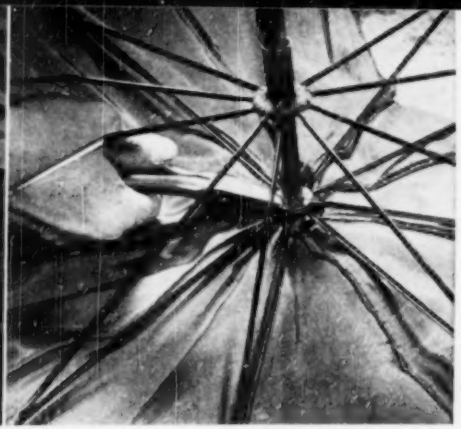
PS photos by W. W. Morris

IF YOU have a storm-battered umbrella that's ready for the ash can, look it over first; it might be worth having fixed. Many broken umbrellas just need a few new parts or a cover replaced to be made serviceable again.

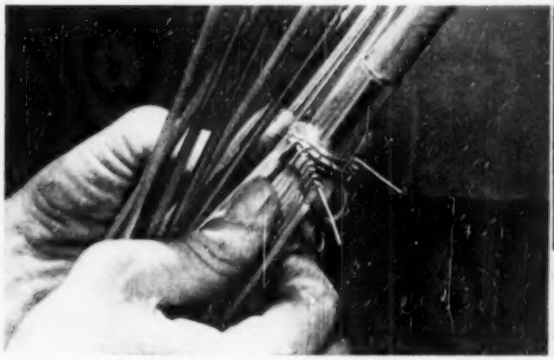
When an umbrella is badly damaged, it takes the hands of a skilled workman to refurbish it, as a PS reporter and photographer discovered on a recent visit to the Uncle Sam Umbrella Shop in New York. Expert in the craft of umbrella fixing, this shop has been making and repairing conventional bumbershoots since 1866. It also supplies magicians and other show people with trick umbrellas and canes. One of these is even an umbrella that makes its own rain when the user squeezes a concealed water bag.

The sequence of photos on the facing and following pages shows how a woman's tattered umbrella with an attractive 18th Century heirloom handle was remodeled. The handle was retained but the frame was replaced, a new cover added, and the design changed to one of the long-stick, Gay Nineties style, again popular today.

1 Brought to the Uncle Sam Umbrella Shop for remodeling and repair, this battered umbrella will be changed from a short-stick to a long-stick style, as shown on the opposite page.



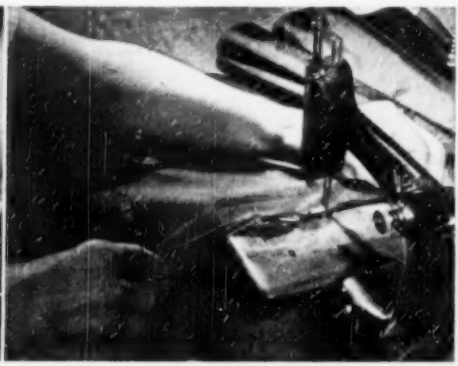
2 To free the twisted frame from the stick, which will be retained because it is still usable, the repairman cuts the wire that fastens the ribs to a metal ring, called the notch.



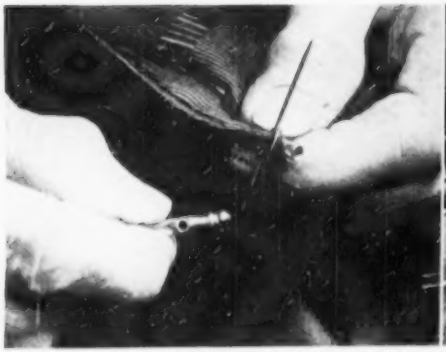
3 After replacing the old frame with a new one having 16 ribs, worker threads new wire through the rib eyes, and inserts ribs into separate slots in the runner, or sliding collar.

4 At foot of umbrella, ribs are also threaded with wire, and then placed in the notch. The sixteenth rib is about to be inserted above. Wire ends will then be twisted with pliers.

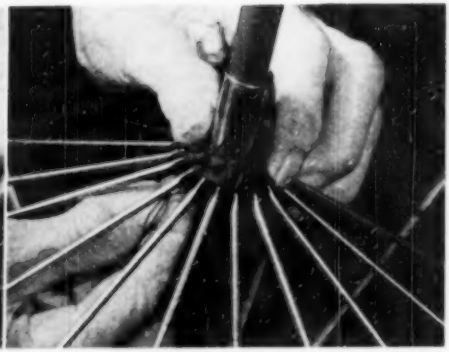
5 Pressing down on a wooden pattern, worker cuts into eight thicknesses of fabric to make panels for umbrella cover. Previously cut panels are shown in the background above.



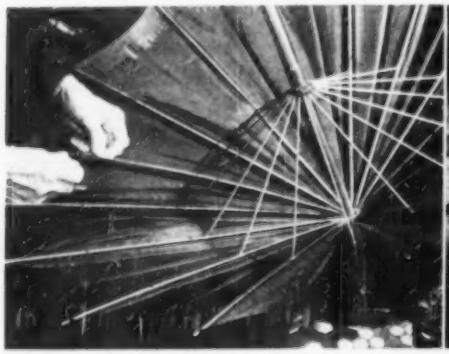
6 Worker sews panels together to make a complete cover. A metal guide, mounted in front of the machine's needle, folds fabric before it is stitched to avoid a raw edge.



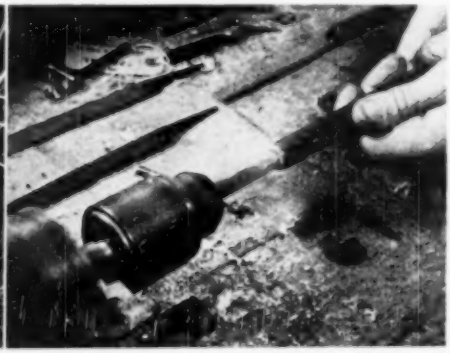
7 **Metal tips** that fit over the rib points are sewed to the umbrella cover by hand, above. Before sewing, seamstress pulls thread through a piece of wax to strengthen it.



8 **To protect user's fingers** from being pinched by the rough edges on the runner when the umbrella is opened, a circular piece of fabric called a "puff" is sewed over the runner.

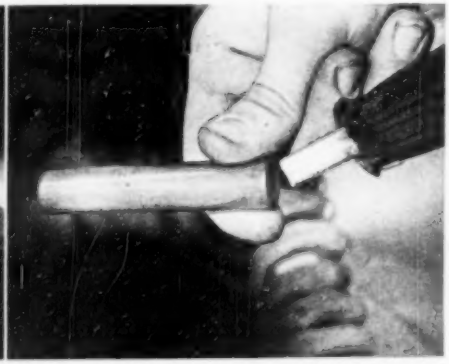


9 **Each rib is tack-sewed** securely to the cover in two places. For the final sewing operation, another fabric puff is stitched to the center of the umbrella on the outside.



10 **Whirling power drill** bores hole in ebony rod, which will be fitted over umbrella stick to lengthen it. The extension rod is polished before it is attached to the stick.

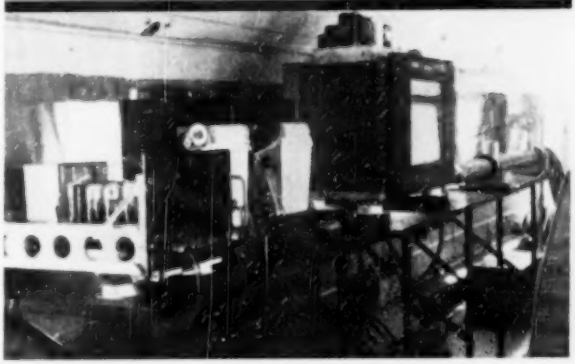
11 **Before slipping the extension rod** on the stick, it is smeared with glue to hold rod in place. As shown above, the umbrella's original heirloom-knob handle has been attached.



12 **The final step** in remodeling the umbrella is to slide an ebony ferrule over the foot end of the stick, so its length will be proportionate to the length of the handle.

Planes and Trucks Speed Uranium Hunt

The hunt for "hot" atoms is getting hotter. Planes and trucks have joined in the search for vitally needed uranium. Now scientists of the U. S. Geological Survey can explore in minutes miles of prospective uranium-ore deposits that would take teams on foot days or months to cover. The upper photo at right shows one of the trucks with two 42-inch-long Geiger tubes mounted on the roof. They can detect deposits while traveling at speeds up to 30 m.p.h. At lower right is the interior of one of the planes, which trail magnetometers that detect changes in the earth's magnetic field produced by radioactive deposits. Also, air samples are tested for radon gas, given off by such deposits.

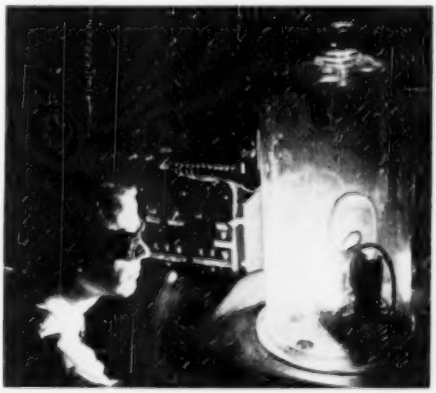


12-Foot Pipe Made of Wood

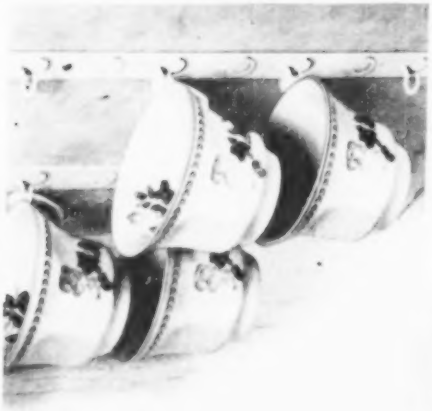
You could drive a two-ton truck through this giant wood pipe. It's 12 feet across inside. Recently completed, it carries water from the Umpqua River in Oregon to the Toketee hydroelectric plant 1,700 feet away. The pipe rests on concrete cradles and is formed of staves of 4- by 6-inch redwood, tongue-and-grooved and bound with 272,000 pounds of ¾-inch-thick steel bands.

50,000 Feet Up in a Bell Jar

When aircraft engineers want to find out what happens to a piece of electrical equipment at high altitudes, they simply place it in this bell jar and pump out the air. Here a switch begins to arc in the thin air of a simulated 50,000-foot altitude. Results of such tests, made at a new Boeing laboratory at Seattle, Wash., help engineers trouble-shoot aircraft failures before they happen.

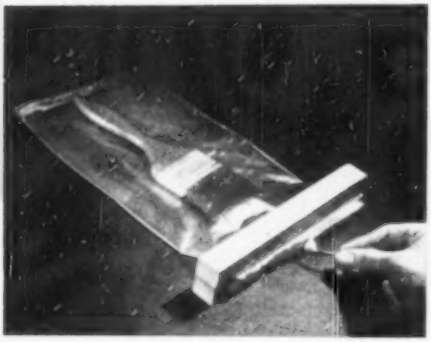


Aids to Modern Living

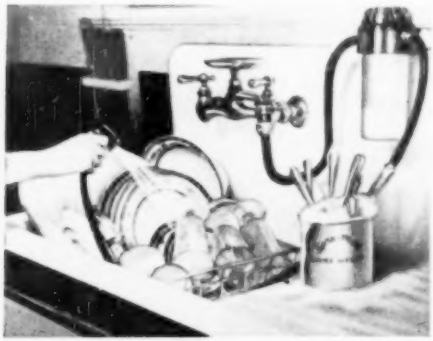


Hooks Stamped in Strip. Just bend out the hooks stamped in these metal strips and you have a place to hang cups and other small items used in the kitchen or bathroom. Each hook holds 20 lb. The strips, which come in several colors, are easily fastened to a shelf with screws. HoCup Mfg. Co., Boston, Mass., prices them at 25¢.

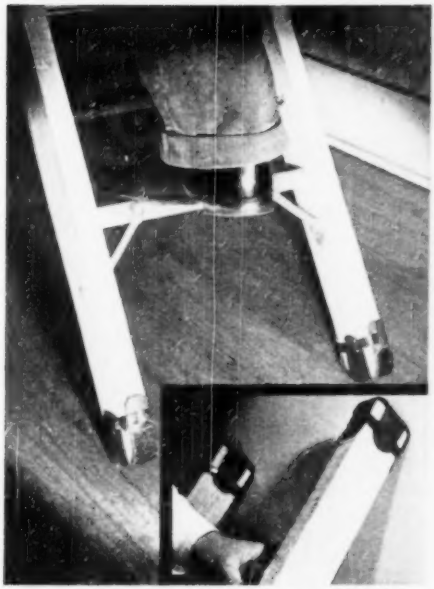
Iron at Right Height. This folding ironing board can be raised or lowered 10 inches so you can either sit or stand while you work. To lower the board, small legs underneath the ironing surface are folded down so they rest on the crossbar of the regular leg frame. Yeoman Corp., of Chicago, sells the board for about $11.



Paintbrush Kept Soft. You can seal this re-usable paintbrush bag with a match. Just place its open end between two pieces of wood, and fuse the edges, as above. Put away without cleaning, a brush can be kept soft by a teaspoonful of linseed oil or turpentine in the bag. Bauer-Lee and Co., Chicago, prices the Flash Seal bag at 25¢.

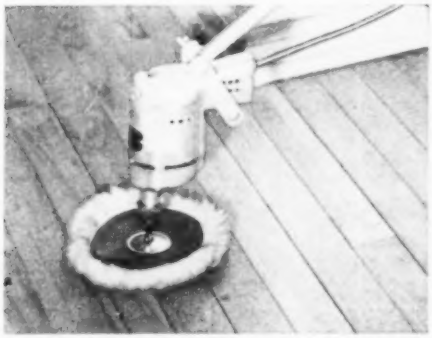


Faucet is Dishwasher. Twist a dial on the container at upper right and faucet water mixes with a detergent for spray-sudsing of dishes—all that's said to be needed for normal washing. Another turn, and water by-passes the detergent for a rinse. Spra-Matic is made by Atlantic Chemical and Equip., Co., Atlanta; sells for about $16.



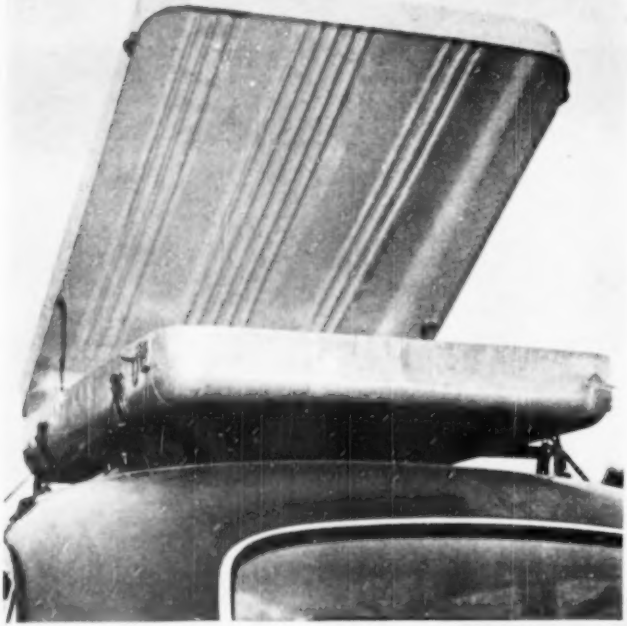
"Shoes" Prevent Ladder Slips. A ladder shouldn't slip, either outward at the base or sideways against walls (inset), with these Sta-Put abrasive-coated rubber grips strapped to the leg ends. They are slip-proof on almost any material, says the maker, E. C. Forsythe & Co., of Schenectady, N. Y., and sell for $1.25 a pair.

Reel Holds Clothesline. With a Reel-Eze winder hung from her shoulders, this housewife's hands are free for cleaning and pulling taut a laundry line as she puts it up. With a hand crank for winding in the line when being taken down, the reel, made by Bok Machine Products Co., of Ft. Wayne, Ind., sells for about $3.



Electric Drill Becomes Floor Polisher. Fit a lamb's wool disk into the chuck of your electric drill, clamp on an aluminum lawnmower-like handle, as above, and you have an efficient floor polisher. These attachments, including a wax applicator, are priced at about $6 by the maker, the Jonrich Co., of N. Y. and Miami.

Giving a Tube an Easy Squeeze. This handy gadget is a slotted plastic cylinder that fits over the base end of a collapsible toothpaste or ointment tube. A handle enables you to empty the tube completely by rolling it up to force out the contents. The Tube Roll-Up Co., of Toledo, Ohio, makes it in six colors to sell for 10¢.

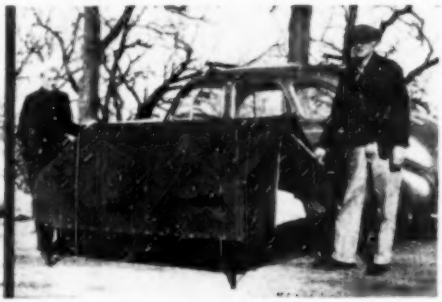


Luggage Carrier. The aluminum case at left gives you an extra 15 cu. ft. of storage space. It is waterproof, held fast by four rubber suction cups, and is sold by Carson Machine & Supply Co., of Oklahoma City, for $49.95.

For Heavy Loads. Tubular steel bars form foundation of Kardek, below. Neoprene-faced saddles rest load on top's curved shoulders, and turnbuckle clamps anchor it to the eaves. The Miller Mfg. Co., of Detroit, is the maker.

What's New On Car Tops

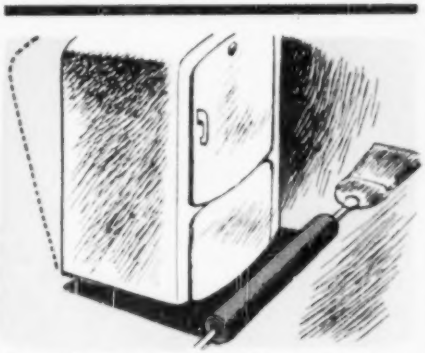
Bed Carried on Roof. It takes only a minute to remove the portable sleeping unit shown below from its car-top carrier and assemble it into the combination bedroom-tent shown at right below. Sleeping two, the bed has a steel frame, innerspring mattress, a watertight canvas top, and insectproof screening. One Minute Bed-Tent Co., of Council Bluffs, Iowa, makes it.



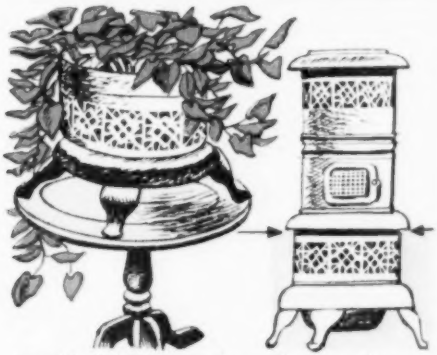
Keeping the Home Shipshape

Give little folks big ideas by hanging a small mirror and towel rack in the bathroom low enough for them to use. If the mirror doesn't have holes, attach it with screw clips.

When you make a frozen dessert, tie a piece of bright ribbon to the refrigerator's control knob as a reminder to turn the control back to normal after you've removed the dessert.



To avoid marring floors, when moving heavy objects, use a throw rug or piece of carpet. Tilt the object back to get the carpet under it. Roll the free end around a broom and pull.

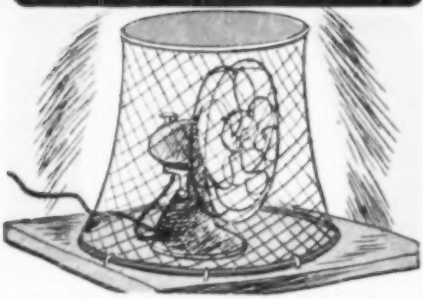


An old oil heater can be made into a flowerpot holder. Remove hinged top part as indicated by arrows in the drawing. Then paint the bottom to match porch furniture.

If you want to bake one potato but don't want to light up the oven these warm months, put a jar top in a coffee can. Put the potato in the jar top, cover, and heat over a burner.

Please turn the page for five more suggestions.

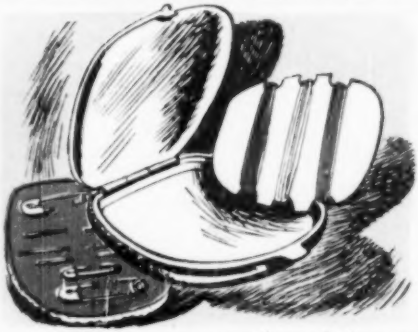
Keeping the Home Shipshape



A simple fan guard to protect children can be made with a board—or any wooden surface—and a wire wastebasket. Invert the basket over the fan and staple the rim.

Here's an easy way to squeeze out hot compresses without burning your hands. Use a potato ricer. With the ricer, you can use water much hotter than your hands could stand.

Canned meat will slide cleanly out of the can if you place the can in hot water for a few minutes before opening it. The heat will melt the layer of gelatin or fat next to the tin.



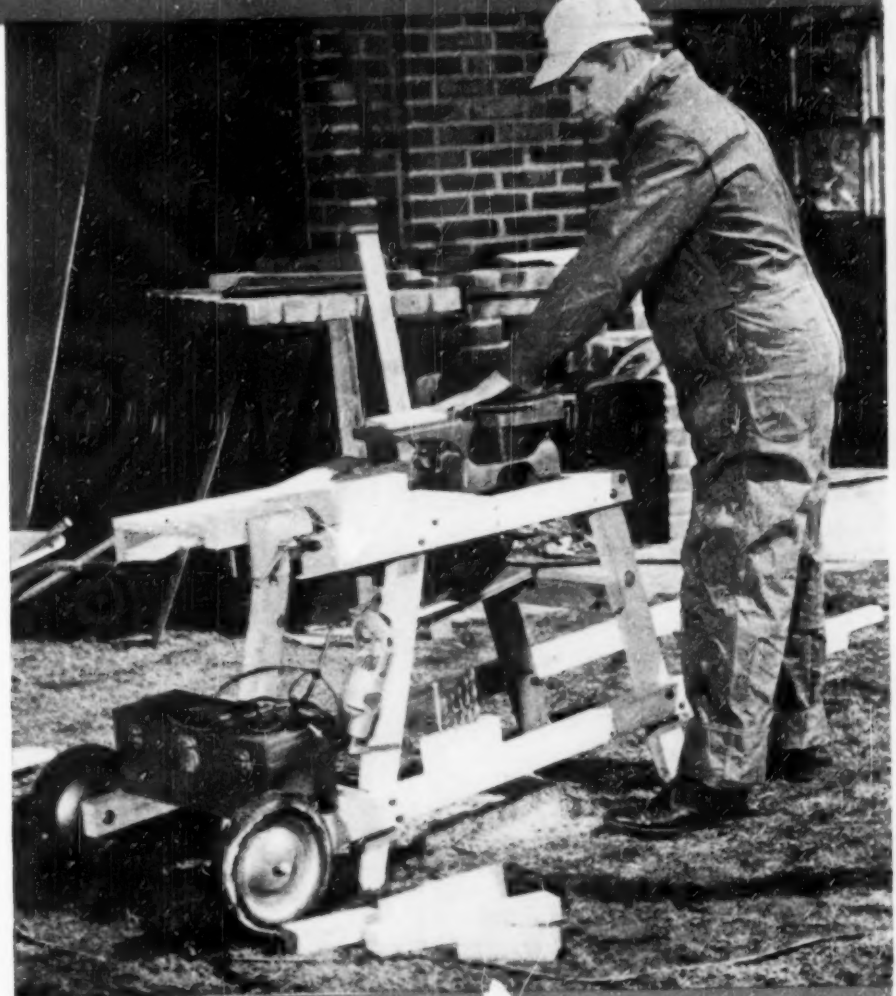
Sewing kit for a purse can be made from an old compact. Remove powder screen and cut cardboard to fit inside compact. Wind thread around cardboard, use puff for needles.

To make gelatin without ice, set bowl of gelatin in pie tin. Put another, filled with water, over the bowl. Drape a cloth over top tin and into bottom one. Evaporation will do the rest.

Mechanics and Handicraft

How To:

Paint Your Own House — PAGE 196
Keep the Heat Outdoors — PAGE 204
Identify Plastic Material — PAGE 214
Give Your Voice Power — PAGE 226



Save time and manual labor by rolling your power tools to outdoor jobs PAGE 190

Gus Cools

a Hot Engine

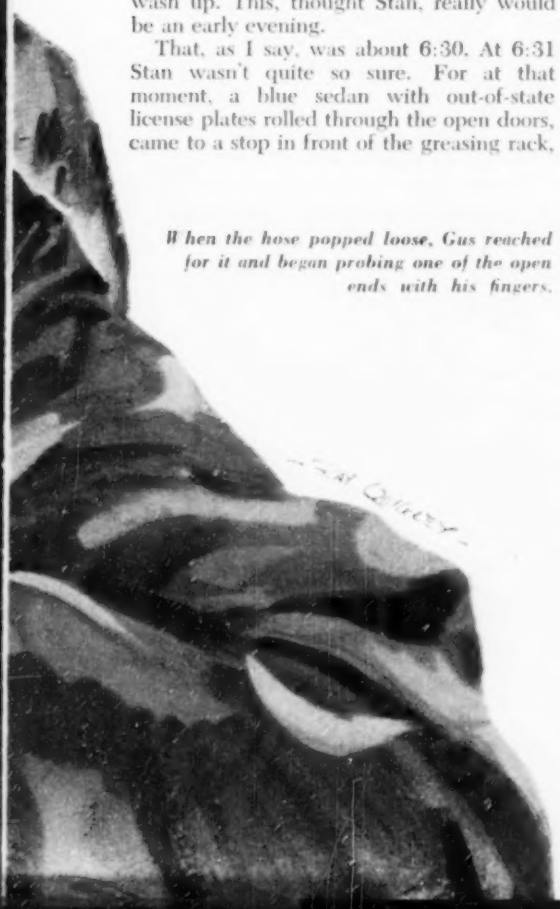
By Martin Bunn

A nasty customer gets slow service at Dan's Grille—but unexpectedly quick service and a pair of handcuffs at Gus's garage.

TUESDAYS, during June and most of July, are usually shorter than most days at the Model Garage. Gus Wilson generally goes bass fishing on Wednesdays, so on Tuesdays he likes to close shop fairly early so he can go home, get his gear ready, and pile into bed for an early start in the morning.

At about 6:30 on this particular Tuesday, Stan Hicks was finishing up his last job for the day, and Gus already had started to wash up. This, thought Stan, really would be an early evening.

That, as I say, was about 6:30. At 6:31 Stan wasn't quite so sure. For at that moment, a blue sedan with out-of-state license plates rolled through the open doors, came to a stop in front of the greasing rack, and a tall, heavy-set man unlimbered himself from behind the wheel.



When the hose popped loose, Gus reached for it and began probing one of the open ends with his fingers.

"The boss here?" The tone of the man's voice made it sound more like a command than a question.

Before Stan could answer, Gus appeared from the rear of the shop. "Something we can do for you?" he inquired. "We were just about to close up for the night."

"Yeah, I've got troubles," the stranger grumbled, jerking his thumb in the general direction of the car. "Just a few miles outside town, the engine started to get hot and sputter. Seemed to lose its power. Just when I'm in a hurry, too. Got no time to waste. Think you can fix it for me right away?"

"We can try," Gus answered, patting his hands with a wad of waste as he looked over both the car and the driver. "Might take time, though, to locate your trouble."

"But I said I was in a hurry!" the stranger snapped. Then, as if a sudden evening breeze had cooled him down a bit, he added, "Okay, but step on it. I'll get some chow. Is there a diner or lunchroom close by?"

After Gus had pointed the way to Dan's Grille—that's one of Gus' favorite eating places—down on the Square, and the man had left, Stan said, "Unpleasant jerk. Why didn't you tell him to peddle his car, his troubles, and his ugly puss some place else 'cause you want to go fishin'?"

"A job's a job, Stan. Besides, those fish will wait for me; they always do. You finish up your job, while I'll see what I can do about tracking down the trouble here."

Gus slid into the driver's seat and started the engine. Stan could see him checking the gauges on the dash. Then he walked around to the front of the car and lifted the hood. The V-8 engine looked particularly clean. Next, he unscrewed the radiator cap.

"Water seems to be circulating," Gus muttered to himself. "Might know it wouldn't be something simple to put your finger on." He touched one of the cylinder heads. It was considerably hotter than it should be.

Slowly and methodically, the veteran garageman proceeded to check the normal things that are apt to cause an engine to overheat and lose power—a slipping fan belt, wrong ignition timing or mixture, poor spark plugs, even low oil level. Everything seemed to be in fair shape. The timing was a little out, but not enough to cause much trouble.

When Stan finished with the car he'd been working on, he walked over to the blue sedan. Gus' head was deep inside the hood. He had a trouble light and was going over the engine carefully.

"What's the matter, boss, this car got you stumped?"

Gus straightened up and flicked off the light. "There's more than one thing about this car that's got me stumped," he answered.

What Else Is Wrong?

For a moment neither man spoke. They both just stood there thoughtfully looking down at the engine. Gus was leaning over, his right hand resting on the nearest of the two hoses that led from the tops of the cylinder heads to the top of the radiator. Suddenly a big grin began to spread across his face. He squeezed the hose with his fingers.

"If it had been a snake it would have bitten me," Gus chuckled. "Stan, I think if you'll drain the radiator and take off that right-hand hose you'll find our trouble. While you're doing that," he added, after a look at his watch, "I've got to make a phone call. If you need me, just sing out."

Service with a Smile

That guy is just too good natured, Stan thought as Gus disappeared into the garage office and closed the door. Probably phoning Ed up at the lake to tell him he'll be late tomorrow, and all on account of some out-of-towner who barges in here at the last moment and wants on-the-spot service.

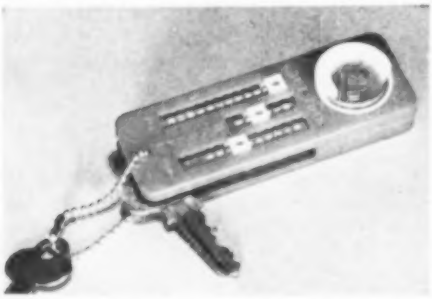
Stan took his time moving another car from the drain hole and setting to the job. By the time Gus came back, the last of the water was just dribbling out of the bottom of the radiator and Stan was attacking the hose clamps with a screw driver.

"I'll have it off in a jiffy," Stan reported.

When the hose popped loose, Gus reached for it and began probing one of the open ends with his fingers. In no time, he had succeeded in pulling out what looked like a cylinder of metal.

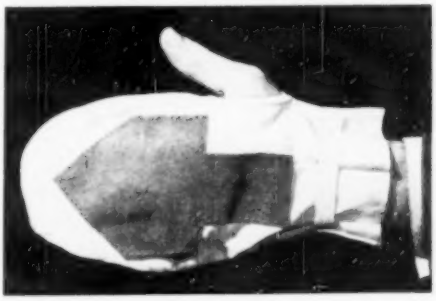
"Thermostat," Gus announced, holding it

Key Holder Times Parking



THIS novel plastic key container reminds you when your parking-meter time has expired. Simply adjust the sliding indicators along each of the three columns of figures to any predetermined time of the day. Top column represents hours; the middle one, units of 10 minutes; and the bottom one, minutes. The Park-Aid Key Kit, made by W. B. Youhon, of Wilkes-Barre, Pa., also has a handy small-change coin bank.

Hand Signals Visible at Night



A DRIVER'S hand signals are spotted quickly at night with this soft, flexible thumbless mitt that fits loosely over the hand, but is held securely by an elastic band. A bright red arrow on the back and white arrow on the palm are made of special light-reflecting material, like that used on many road signs. Available in three sizes, the mitts are priced at $1 each by the Nite-Signal Mit Co., Hollywood, Calif.

up for Stan to see. "Or at least part of one. There are two thermostats in these V-8s, one mounted in each of the two water outlet fittings that extend up from the cylinder heads. From the looks of things, this one got badly rusted and came loose. Water pressure forced it up into the radiator hose where it jammed and shut off most of the water circulation to that bank of cylinders.

"See if we've got a replacement in stock, Stan," Gus added. "I'll remove the water outlet fitting and cut a new length of hose."

Working together, it didn't take them more than about twenty minutes to install a new thermostat and the new length of hose. When they had finished, Gus looked at his watch.

All This and Timing Too

"Our man won't have reached dessert yet," Gus said. "Might as well do the job right and adjust the timing while we're at it."

Stan was just about to make some comment about doing so much for a peevish stranger they'd probably never see again when the office phone rang.

"I'll get it," Gus called as he hurried toward the office door. "Probably for me anyway."

Stan was fussing with the timing when Gus came back out of the office. What he saw next was hard to believe. Gus picked up a cloth and began wiping the car down.

"Pretty dirty," Gus offered in way of explanation. "Might just as well give it a good dusting while we're waiting. Nothing like a little extra service for a friend."

"Friend?" Stan grunted. "Why that guy wasn't even civil."

"Did seem that way," Gus answered with a grin, as he went right on with his cleaning job, even to spraying the windows and the windshield and wiping off the hub caps.

Best Is None Too Good

Stan couldn't figure out Gus's desire to give so much extra service to someone who obviously was just a one-time customer and a not-too-pleasant one at that. However, he'd worked for the gray-haired mechanic long enough to know that he usually had a good reason for just about everything he did.

Stan had just closed the car's hood and was rolling the engine analyzer back to the bench when the bulky stranger strode through the open doors.

"My car ready?" he barked as he came in.

"Just finished with it," Gus replied. "We had to put in one new thermostat and adjust the timing. That'll be $8.75 for labor and parts."

"What?" the man bellowed belligerently. "$8.75? I didn't expect to have to pay for an engine overhaul."

"Take it or leave it," Gus shot back.

"I'd sure like to leave it if I could," the man continued to grumble. Then, reluctantly, he dug down into his pocket, pulled out a wad of bills, and peeled off a crisp, new ten. "I haven't the time to argue. Give me my change and I'll get out of here."

"Did you just buy this car secondhand?" Gus asked as he slowly counted out $1.25.

"What business is that of yours?" the fellow snapped.

"None, but it's plenty of mine," put in a new voice.

As the man spun around, he bumped smack into Sergeant Jerry Corcoran who had come quietly out of the office.

Quickly, the stranger made a dart for the door only to tangle with Gus's out-thrust foot and go sprawling on the floor. Jerry was on him almost before he hit.

"Nice work, Gus," Jerry said as he snapped a handcuff on the man's wrist. "Wouldn't be surprised if we find more than car snatching on this guy when we begin

checking up. In any case, he won't be around for awhile."

Stan just stood there bewildered as Jerry led the stranger out the back door to a white squad car where another trooper was waiting. Finally, he said, "Will you please tell me what the devil this is all about? If you knew the car was hot and the fellow was a crook, why did we do all that work?"

Gus laughed. "I just didn't want Jim Fleming to have to pay for those repairs," he grinned.

"I still don't get it. Who is Jim Fleming?" asked Stan.

"He's an old friend of mine, and the owner of this car," Gus explained. "When Jim lived here in town I used to see quite a lot of him. About a year ago, Jim and his family had to move over to Brighten and I hadn't seen either Jim or his car again until tonight.

Something Familiar Here

"It's funny, but the minute I started working on that engine," Gus continued, "I had a feeling I'd worked on it before. Then I happened to notice something—a welded brace on the generator support. I remembered I'd done a job just like that on Jim's car just before he'd left. So, I played a hunch. I made a note of the motor number and put in a long-distance call to Jim. I had no idea of his address, or whether he was still in Brighten, but the operator located him for me.

"He didn't know whether his car had been stolen or not. His wife had both the car and the license. He hadn't the slightest idea of what the motor number was; that was on the license. He said he'd try to locate his wife and call me back. When he did call back, everything checked, including the motor number. Seems his wife had parked the car in downtown Brighten and left the keys in the ignition. When she discovered the car was gone, she went right to the Brighten police without letting Jim know. They put a description of the car and the license number on the police teletype, but our pal had switched license plates.

"After I'd talked to Jim the second time, I called the State Police Barracks and tipped off Jerry Corcoran."

Waiting at the Plate

"But," put in Stan, "how did you know our friend wouldn't get back here ahead of time and mess up your little plan?"

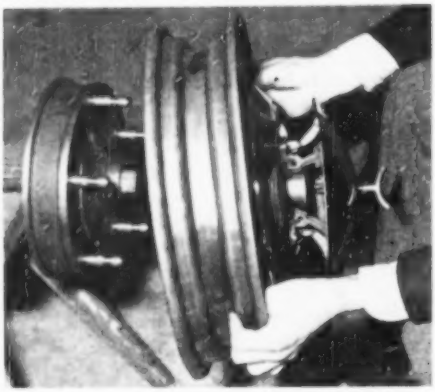
"Elementary, Dr. Watson," Gus explained with a grin. "I just called Dan and told him to give our customer the slowest service that Dan's Grille ever served up."

"Okay, Boss," Stan grinned. "Tomorrow we'll have a new sign made: 'Model Garage—Sherlock Wilson, Prop.—Auto Repairs and Crimes Solved'." END

Robot Collects Parking Fees

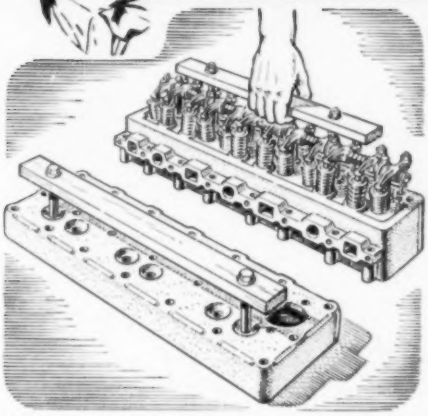
THE hands at left are those of a driver making use of the Selfpark system to park his car in an unattended parking lot. After placing a coin in the slot and pulling down on the knob, the driver takes the numbered ticket that comes out and attaches it to his steering wheel. One attendant can check many lots daily to make sure each car has that day's tag hung on it. Stanford Research Institute, Stanford, Calif., engineered the machine.

Change Wheel in 10 Seconds



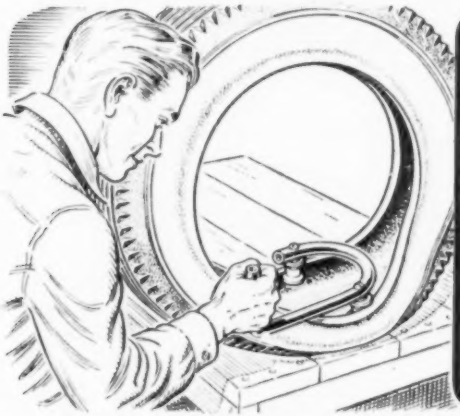
CHANGING auto wheels will become a simpler and speedier job if a new fastening device lives up to the claims of its inventor, Lothar Stanetzki, of Bonn, Germany. Five threadless bolts on the brake drum enter holes in the wheel, as shown above, and are grasped securely by five plierlike levers that are locked by pushing in on the hub cap. The gripping action is said to increase with the motion of the wheel.

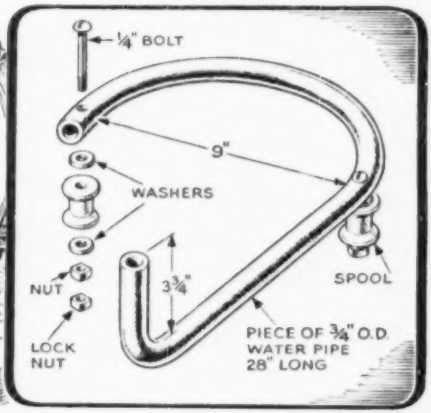
Hints from the Model Garage



Lifting an Engine Head. A cylinder head is always a clumsy object to handle. A wood lifting bar makes the job easier. For an overhead-valve engine, drill holes in the bar to suit the studs that hold the rocker-arm cover. For a big L head, run bolts through properly spaced holes and thread into the end spark-plug holes.

Block Keeps Jack Stable. Most jacks tend to tip over while being cranked up to the axle or jack pad. To prevent this, Clinton B. Casler, of North Westport, Mass., drilled four holes in the base and attached a block of wood to it with screws. Such an enlarged base also gives the jack a firmer footing on soft ground.



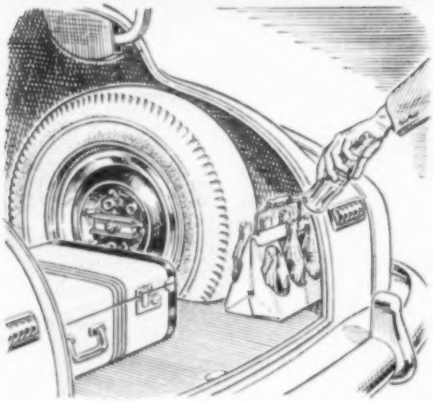


Tire Spreader from Scrap. If you run a repair shop, the convenience of this tire spreader will soon pay for the trouble of making it. Cut a piece of water pipe to 28" length. Bend one end to a 9" arc. The excess serves as a handle. Mount two thread spools in the locations shown, leaving them free to revolve.

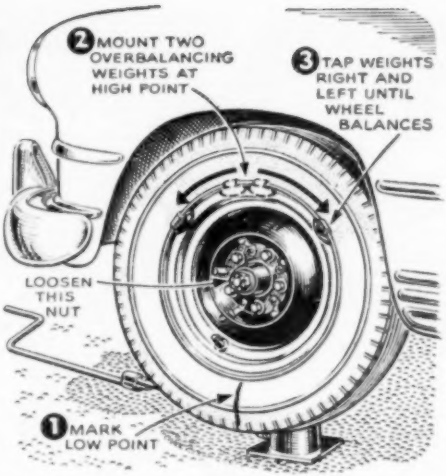
To use the tool, insert the spools into the casing, allowing them to rest against the bead on opposite sides. To spread the casing, move the handle inward.

Turn the page, please, for three more auto hints

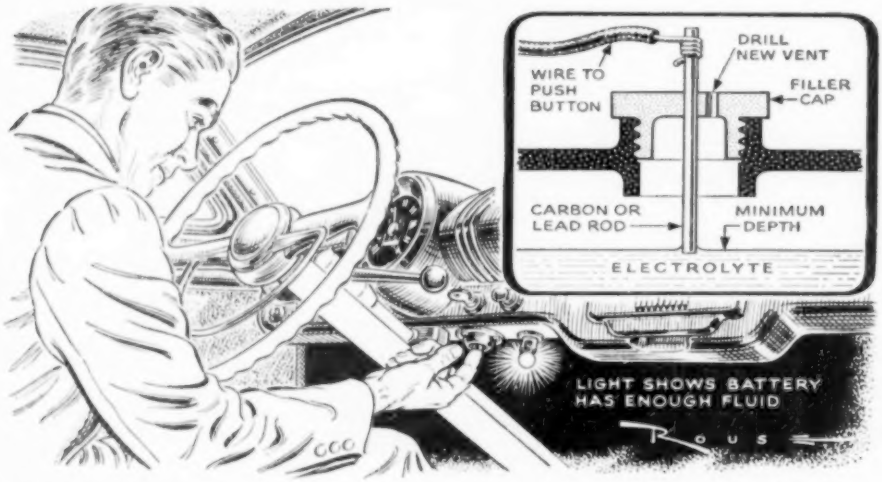
MORE Hints from the Model Garage



Carrying Empty Bottles. If you consume a lot of cold drinks while traveling during the summer, you're apt to collect quite a few deposit bottles. To store these, keep a 6-bottle carry carton in the trunk compartment and they won't rattle around.



Balancing a Wheel. Paul L. Bratain, of Azusa, Calif., suggests you mount the wheel in front, loosen the bearing nut, and spin it to find the low (heavy) point. Then proceed as shown. At the high point, the weights must overbalance the low side.



Light Checks Battery Level. To keep tabs on his battery electrolyte level during long, hot drives, Lawrence Avery, of Washington, D. C., installed a system like this. When you press the button, the bulb lights only if the fluid is still up.

You can rig such a system by mounting and grounding a 4-volt bulb on the dash. Connect the other bulb terminal through a push-button switch to a carbon or lead rod set in the filler cap nearest the ungrounded side of the battery. When the electrolyte level falls below the rod tip, the light circuit is broken.

As a precaution, keep the electrolyte level a little higher in the other two cells.

When mounted, aluminum visor compares favorably with a commercial job—and costs less.

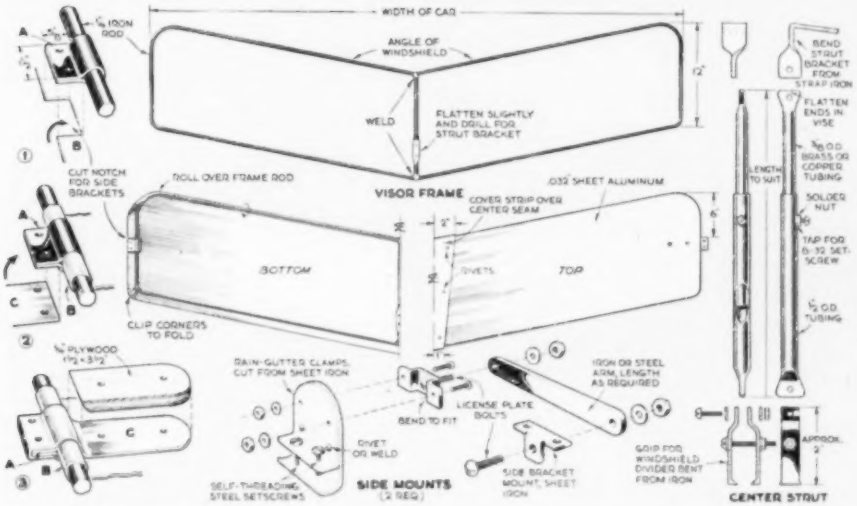
Homemade Visor Costs Only $4

By Roland Cueva

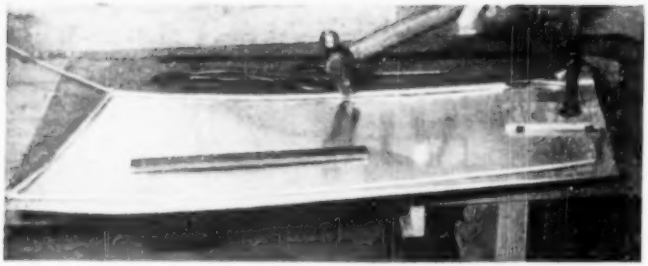
THE day I installed my aluminum visor, a friend wanted to bet it was too flimsy. I wish now I had taken the bet. Months later, the visor still is rigid. It has not shown the slightest sign of a wobble.

Even if you buy all materials, a visor like this usually can be built for less than $4. Material at hand may reduce the total cost.

Frame. Measure the car width across the windshield posts and take the sweep-



Side-bracket details are seen from below in Figs. 1 to 3. Roll the notched aluminum (B) around the rod. Bend stiffener strip (C) up and over bracket (A). Rivet through plywood.



Aluminum rolls easily over the ¼" rod frame. Pound it down as shown here and then smooth the rolled inner edge with an iron bar like the one in foreground. Notice side bracket on the rod at the right.

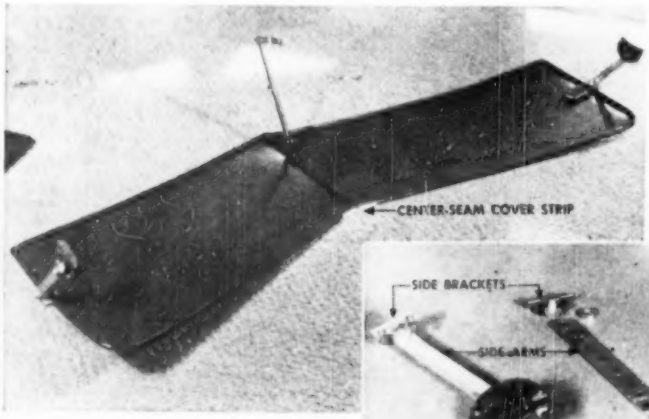
back angle. Then cut a cardboard pattern 12" wide for half the visor, transfer it to plywood, and saw it out.

Nail the wood pattern to your workbench or shop floor. Starting at the center back, form the ¼" aluminum or iron rod around it. Clamp or nail the bent rod in place. When you reach the center front, pry up the pattern, flop it over, renail it, and continue bending the rod to the starting point. Cut off the excess rod and weld a piece 11½" long across the frame center. With a hammer, flatten a part of this member and drill two ¼" holes for the strut bracket.

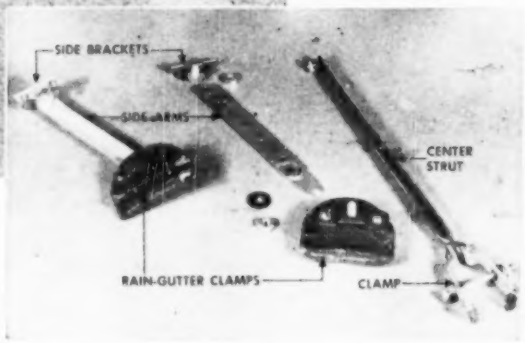
Covering. Use .032" aluminum for this. A sheet 18" wide and 5½' long will do the job. Put down the pattern and mark around it 1¼" from the edge except at the center line, which you mark flush. Snip out this panel. Then turn the aluminum over. Use the same center line to mark and cut the opposite panel.

Clamp the frame to the aluminum and roll the sheet over the rod. Clip the corners so they will pound down smoothly. When you install the side brackets, stiffen each, as shown, with an aluminum strip rolled over it and sandwiched between the cover sheet and a plywood block. Fasten by rivets through this sandwich. Make the center strut bracket and attach it with machine screws. An aluminum cover strip is riveted over the center seam and the ends rolled over the frame. Take the visor to the car. Bend it down gently over a sawhorse until it conforms to the roof curve.

Fittings. Details of these are illustrated but they must be made to fit your particular car. Shape the gutter clamps to match the gutter, and use nonrusting stock. END



Finished visor, seen at left, can be lacquered to match car. In this case, the middle cover strip on the top surface was left bright. Note how side mounts and strut are attached.



Adjustable fittings used are pictured at right. Instead of making side arms as shown, you could use casement-window adjusters. The strut clamps to base of windshield divider.

Performing these simple home experiments will disclose the secrets inside of the meters and gauges in your car.

How Dashboard Instruments Work

By Kenneth M. Swezey

NOT many years ago an auto driver tested his gas supply with a stick—or found it was gone when his car stopped. He figured that his cooling system wasn't working when the radiator steamed; that oil circulation must be bad when bearings burned out or pistons froze in cylinders. If a policeman chased him, he was going too fast.

Today—thanks to ingenious electrical and mechanical devices—all these important variables of car operation are clearly registered on dashboard dials.

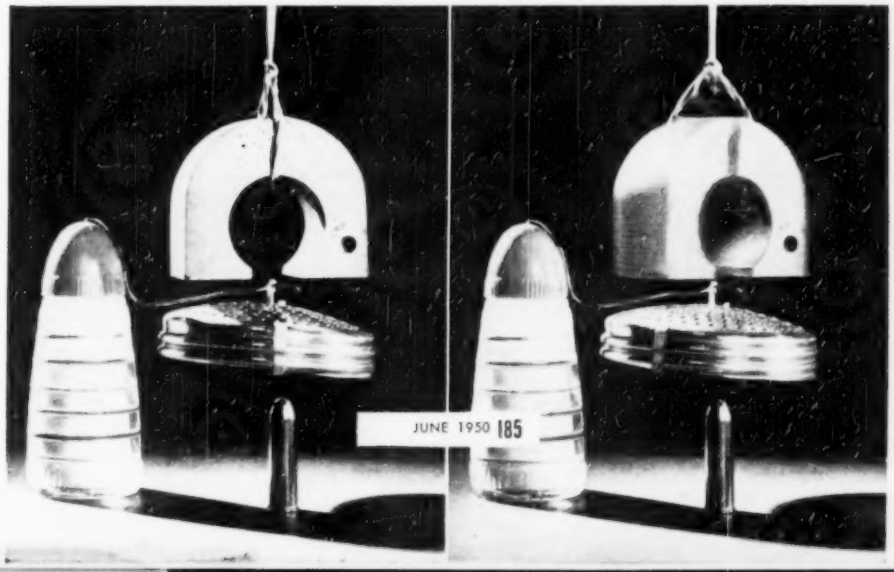
How telltale pointers can gauge the depth of gasoline in a tank, the pressure of oil, the temperature of water, or the speed of a car mystifies many car owners. But a closer look reveals basic scientific principles that are easy to demonstrate and understand.

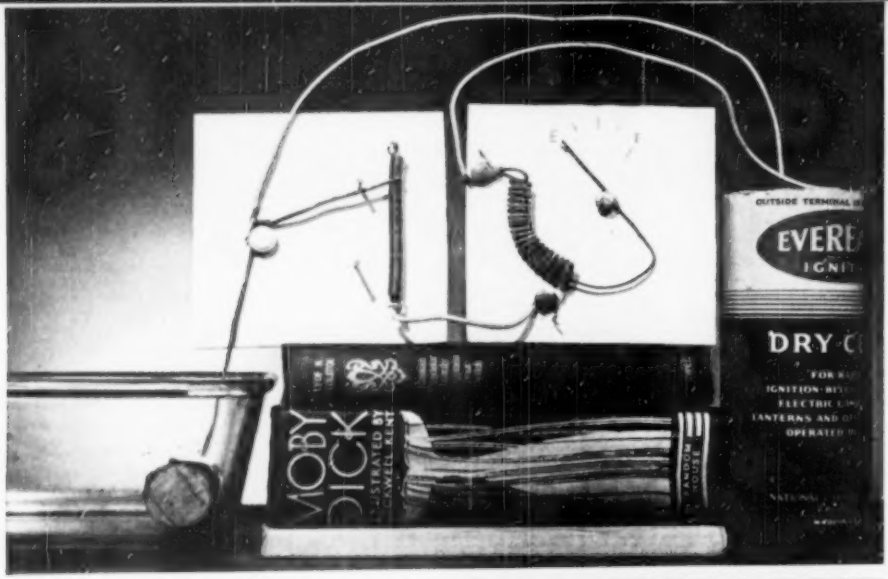
These stunts may help you do both.

The speedometer—connected to the propeller shaft by a flexible cable—tells you your car's speed by a little lightning arithmetic. It counts drive-shaft revolutions and relates them to the size of the wheels. In one type, the indicating pointer is coupled to the rotating shaft through a centrifugal governor. In the usual type, however, coupling is achieved entirely by a trick of magnetism. You can show how this is done with the simple setup pictured below.

Suspend the top of an aluminum flour shaker at its center from a short length of rubber band attached to a horizontal wire. Stick a bit of gummed tape on one side as a marker and stand a pencil cap beneath the marker to note its position. Directly above the shaker top hang a strong horseshoe magnet on a rubber band.

Twist the magnet a dozen times and let go. As the magnet spins it *induces* currents in the aluminum, causes the cap to turn in the same direction. Speed of magnet rotation determines how far the shaker lid will swing. In a real speedometer a magnet connected to a flexible shaft rotates inside an aluminum cup to which the pointer is attached. A hairspring resists the torque of the rotating magnetic field.



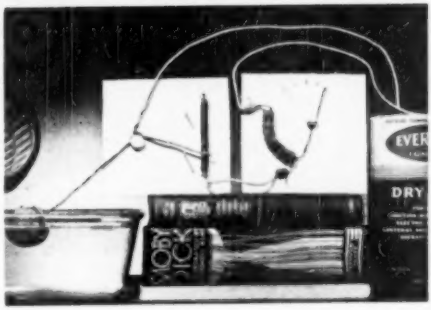


Gasoline gauges in most of today's cars work electrically. A tank unit—a rheostat controlled by a float—is in series with the battery and a current-reading meter on the dash. As the fuel level changes, the float rises or sinks, thus altering the resistance of the circuit and the reading of the meter.

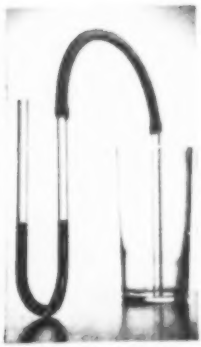
You can make a simplified model of such a gauge as shown in the photo above. For the moving part of the tank unit, bend a stiff wire and form a small loop at the bend to serve as a bearing. Pivot the wire by driving an upholstery nail through the loop and into a board. Fasten a cork to the longer leg of the wire.

The resistance element is a light steel spring stretched slightly between two nails. The shorter leg of the bent wire slides along the spring. Two nails are used as stops for the slider.

The meter unit on the dashboard can be represented by the solenoid coil and pointer illustrated. Wind 20 turns of bell wire around a pencil and bend the coil in a quarter circle. Make the pointer and core from a single piece of iron wire, again forming a small loop for a bearing. When assembled as shown, the core will be drawn into the solenoid a distance proportional to the current that is passed through the coil.



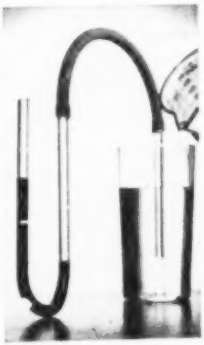
Connect the two units and a dry cell in series. When the tank is empty (top) the cork rests on the bottom and the meter hand points to E. When the tank is filled (above) the cork rises, lowering the resistance of the circuit. This allows more current to flow, which draws the core further into the meter coil and moves the pointer up toward F.

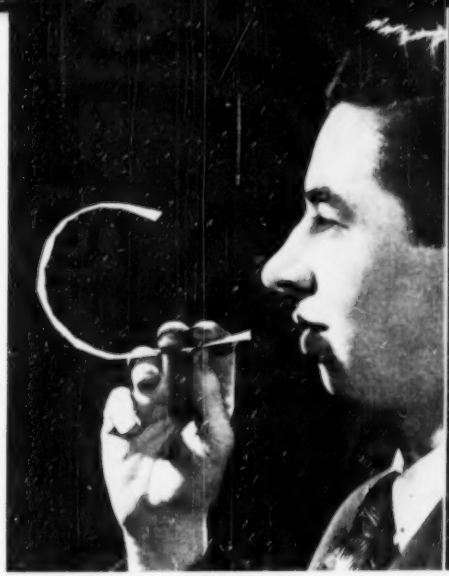


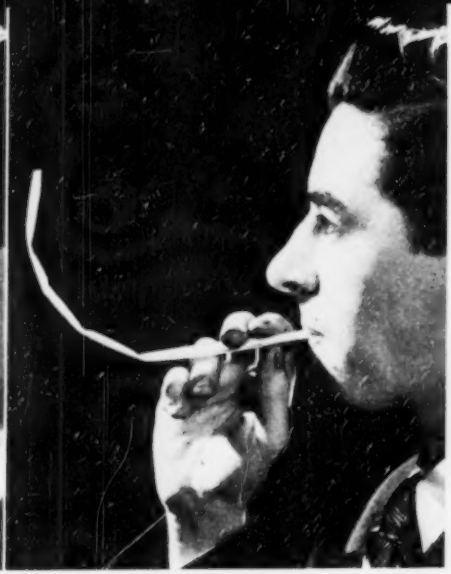
An earlier type of fuel gauge used hydrostatic pressure. In this system a vertical tube in the fuel tank is connected to one leg of a U-shaped tube containing colored liquid. The other leg forms part of the instrument panel. Gasoline rising in the tank tube compresses the air above it. Pressure transmitted to the dash unit raises the colored liquid in the open leg of the U.

To demonstrate the operation of this gauge, partly fill a glass U tube with ink-tinted water. (If you don't have a U tube, connect two straight ones with rubber tubing.) Join one leg with rubber tubing to a straight tube standing in an empty tumbler.

When the tumbler is empty the colored liquid stands at equal height in both legs of the U (left). But when you add water (right), the liquid in the open leg rises.



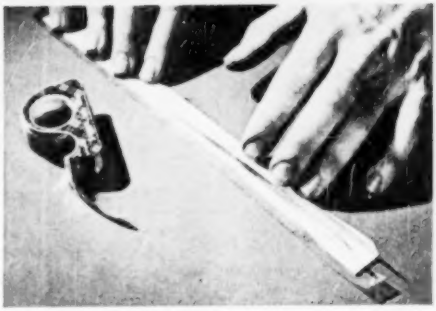




A Bourdon tube forms the heart of both oil-pressure and engine-temperature gauges in a lot of cars. This ingenious device consists of a thin metal tube of oval cross section, which is sealed at one end and bent to a nearly complete circle. When a liquid or gas is forced into the open end, the tube tends to straighten. The same principle is used in the toy "tickler" that unrolls a long paper tube when you blow in one end.

You can quickly make a working model of a Bourdon tube from a 1½" by 10" strip of paper, some cellulose tape, and a 10" length of springy wire. Fold the strip lengthwise and sandwich the wire in the fold (right). Seal the open edge and one end with the tape. Then bend the tube to the shape shown at the upper left. If you now blow in the open end, the tube will tend to straighten out in proportion to the pressure. This is because the flattened tube tries to become round, which straightens out the coil.

In a real oil gauge, a thin copper tube connects the open end of the Bourdon tube to the lubricating system. Oil entering the lower end of the connecting tube compresses the air above it. The closed end of the Bourdon tube is linked to the pointer of the oil gauge.



In the temperature gauge, pressure is supplied by the vapor of a low-boiling liquid such as ether. A bulb containing the liquid is screwed into the water jacket of the engine and connected to the dashboard gauge by a thin copper tube. As water in the jacket warms up, the vapor pressure of the ether increases, causing the Bourdon tube to straighten and move a pointer over a calibrated scale.

The power of vapor pressure at low temperatures such as is used in the temperature gauge can be demonstrated vividly with the equipment shown at the left. Pass a jet-ended glass tube (a medicine dropper connected by rubber tubing to a straight tube will do) through a one-hole stopper large enough to cork a milk bottle. Just below the stopper, attach a small open vial containing a little ether or acetone. Now fill the bottle three-quarters full of warm water (much warmer for acetone than for ether) and press the stopper in firmly.

When the liquid in the vial warms up, its increased vapor pressure will force water up the tube, forming the spectacular fountain you see at the right. *Caution: perform this experiment only in the open or in a well-ventilated room. Be sure there are no open flames nearby.*

New Gauge Flashes Warning If Tire Pressure Drops

By R. P. Stevenson

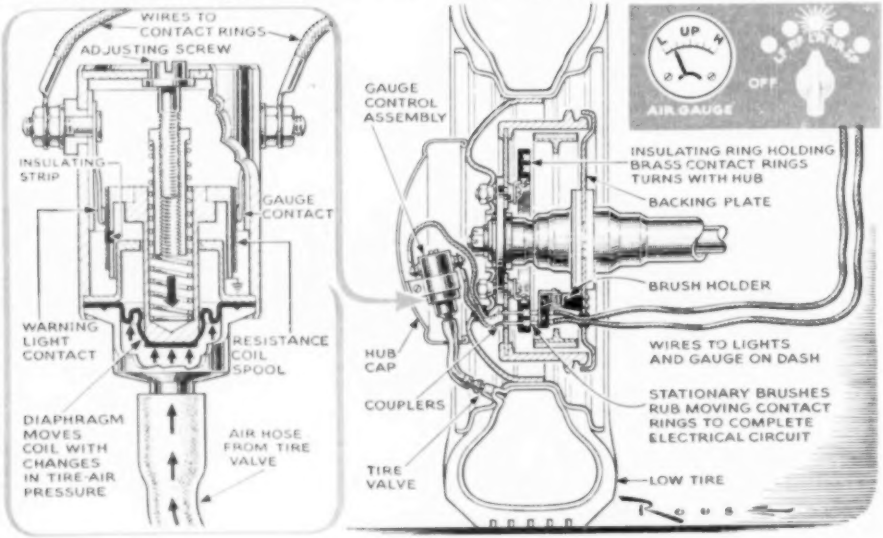
BACK in 1939, a couple of mechanics were doing some dreaming. Wouldn't it be fine if a motorist could check his tire pressures from the driver's seat?

Friends pooh-poohed the idea. But Roy Addy, of Flint, Mich., and his son, Henry, of Milwaukee, Wis., set to work. The result was the new Air-Rite Tire Gauge.

Here's what it will do:

- If tire pressure drops five pounds or so below normal, a dashboard light comes on. There are five lights—one for each tire, including the spare.
- If pressure builds up on a hot road to an unsafe maximum, the lights also flash a warning.
- When a light comes on, you

How it works. A resistance coil on each wheel controls the system. When tire pressure rises or falls, a spring-loaded diaphragm moves the coil endwise. This varies the resistance and gives a relative reading on a dial. A second electrical circuit operates warning lights.



turn a selector switch, cutting into the electrical circuit that extends to the tire indicated by the light. A dial immediately shows whether the pressure is low or high, and about how much. If the pressure continues to fall, the needle will show it.

● At any time, with the ignition key on, you can check the pressure in each of the five tires simply by turning the selector switch to the five dial points. You can do this even while the car is in motion.

The key to the system is a control assembly under the hub cap of each wheel. Inside the control, tire pressure pushes against a spring-loaded diaphragm. This is fastened to the end of a resistance coil so that as pressure rises or falls, the coil moves in or out. Two brass contacts ride against the coil.

These contacts are wired to two brass rings inside the brake drum. Bearing against the revolving rings are stationary brushes mounted on the brake backing plate.

Each brush is connected to one of the two electrical circuits that operate to each wheel. One circuit actuates the warning lights, the other the gauge. The control coil is grounded and the electrical return of each circuit is made via the wheel bearings.

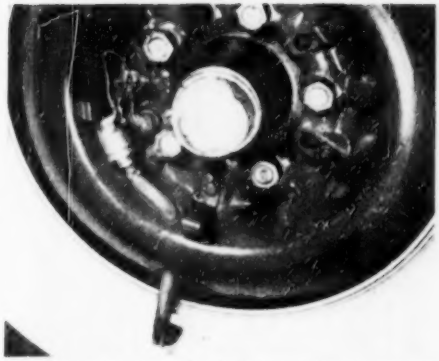
As long as tire pressure is at the recommended figure, the sliding contact of the warning-light circuit rests on an insulated spot on the coil. The electrical circuit, therefore, is incomplete. If pressure rises or falls, however, the coil moves, and the brass contact slides past the insulated section. Now the circuit is complete—and the warning light comes on. An adjustment screw sets the coil for any desired tire pressure.

Works Like Gas Gauge

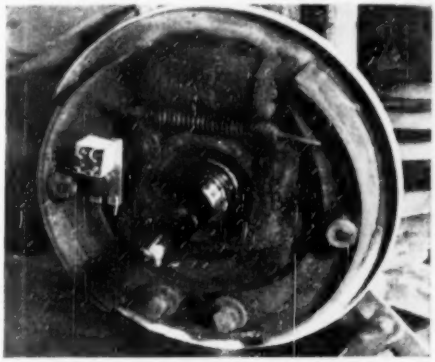
The pressure gauge works like your gasoline gauge. As the coil moves endwise across the fixed contact, the resistance varies in the gauge circuit. This varying resistance is translated, through electromagnetic action in the dash unit, into a needle reading that shows tire pressure.

The George J. Mayer Co., of West Allis, Wis., is now making two versions of the Air-Rite gauge. The de luxe type shown is about $85 installed. A simpler type, with only the warning-light feature, is expected to sell for about $45 fitted to the car.

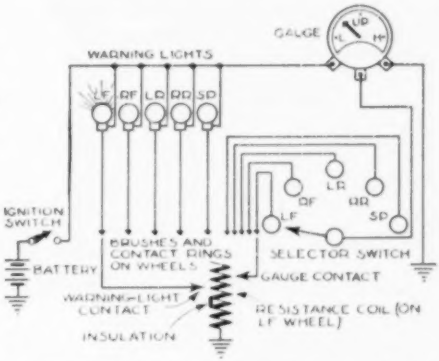
In the lower-priced gauge, an aluminum tube replaces the resistance coil in the wheel control. Like the coil, this tube has an insulated spot on which the contact rests as long as the tire pressure is normal.



Control unit fits under hub cap. Hose connects it to tire valve. Wires run to two contact rings on the inner flat face of brake drum. Bayonet couplers disconnect wires for changing tires.



Two stationary brushes on the brake backing plate are seen at left above. Each rubs against one of revolving contact rings on drum. After unit is installed, the wheel must be rebalanced.



Warning-light contact rests on insulated spot if pressure is normal. When pressure changes, coil moves. This completes circuit, turning on the light. Sketch shows only one wheel coil.

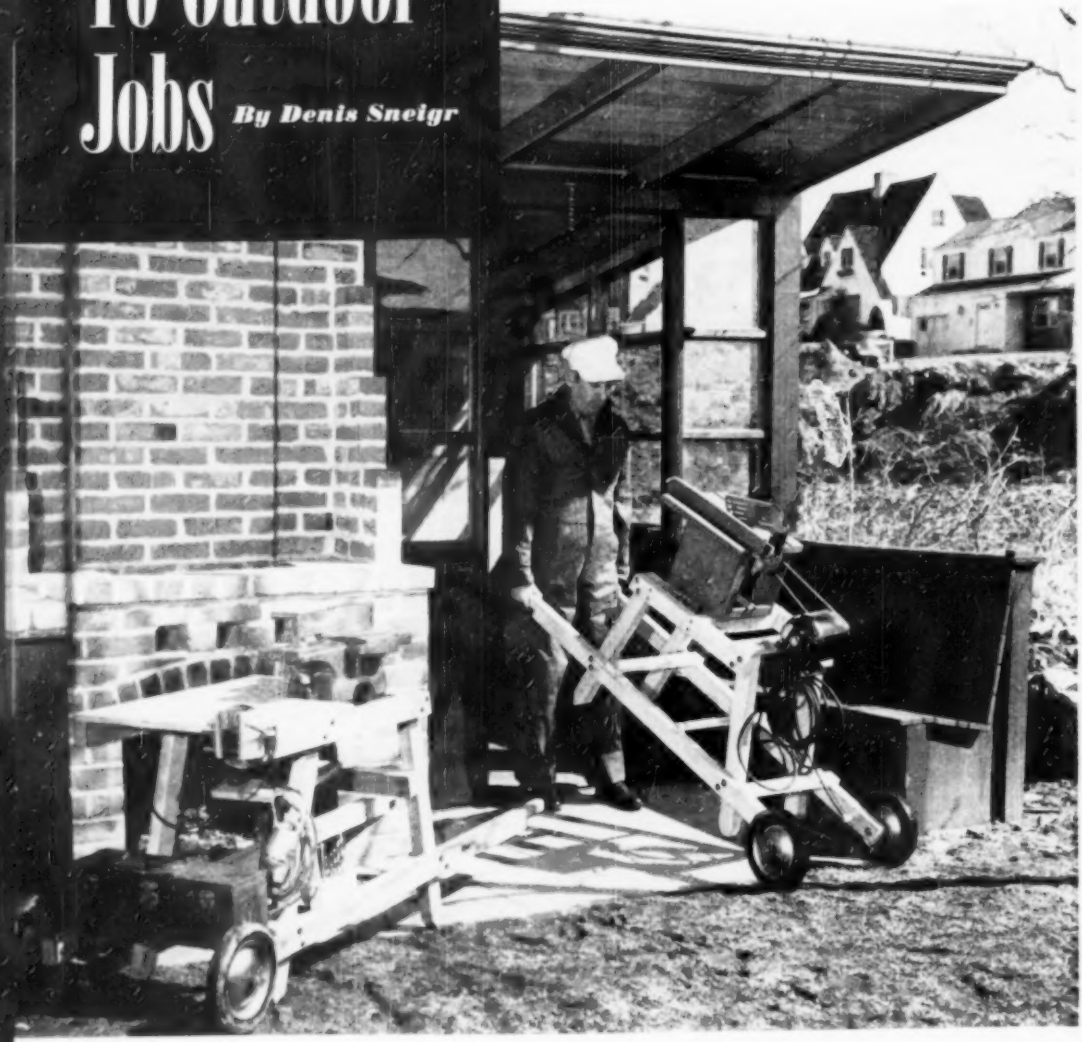
Roll Your Power Tools To Outdoor Jobs

By Denis Sneigr

PS photos by W. W. Morris

WANT to build a garage, summer house, or maybe a dock at your summer cottage? Then take your power tools right along with you. Mount them on wheeled stands and you can use them anywhere within extension-cord reach of an electrical outlet.

Both the jointercart and the sawcart pictured here are so designed that all four legs clear the ground as soon as you raise the handles. They roll smoothly on the 10" semi-pneumatic wheels. Once you've pushed

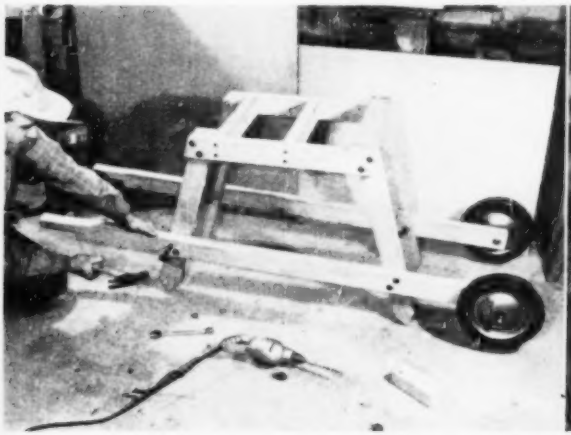


them to the job, the pointed legs set firmly in the ground to hold the tools steady as you work. And both the carts are heavy enough to be stable on a concrete floor or walk.

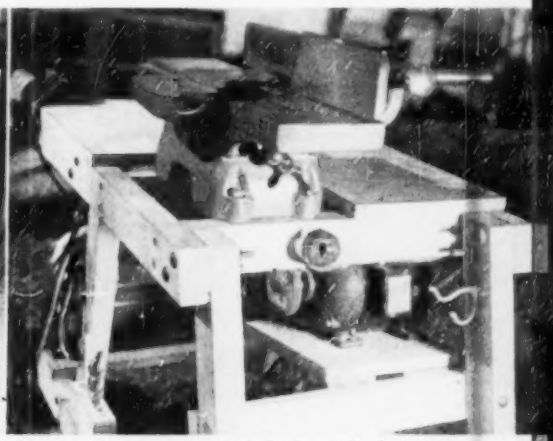
When you have finished a job outdoors, you can roll the carts back into your shop. Indoors you'll find your tools are more versatile on these carts than when mounted on permanent bases. That's especially true if the room that houses your shop is small. With the tools on wheels, you can move them around to handle longer work.

The dimensions of the frames depend on your tools. The height you want the saw and jointer from the ground depends on your own preference. All the main frame members are 2" by 3", including the crosspieces to which the saw and jointer are bolted. The smaller crosspieces are ¾" stock. Four-inch ⅜"-16 carriage bolts hold the frames together. The legs sit at 15° to the frame and the points are cut at 35°. Before the 15° cuts were made, the sawcart's legs measured 25" and the jointercart's 29".

Positioning the wheels is important if the legs are to clear the ground properly when

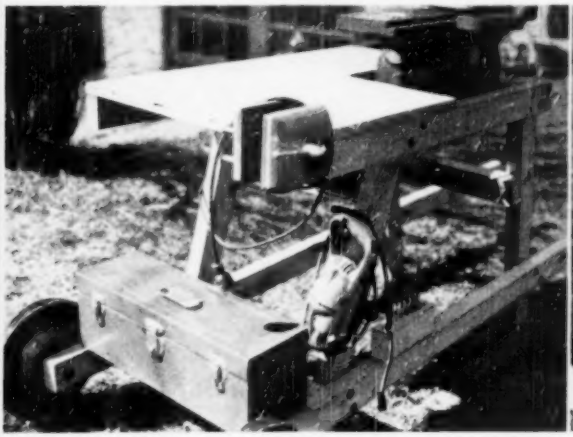


Details of sawcart construction are shown above. Crosspieces are held by wood screws 3½" long. Distance from grip to leg is 18".

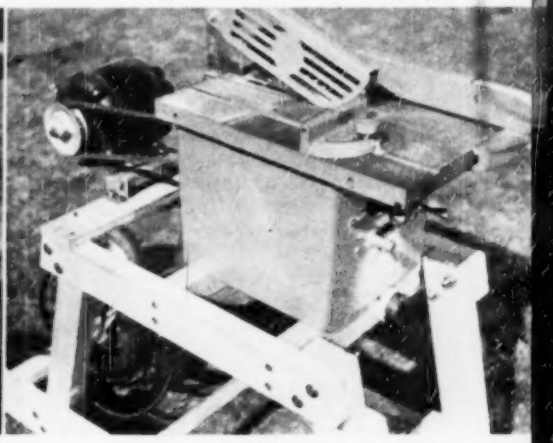


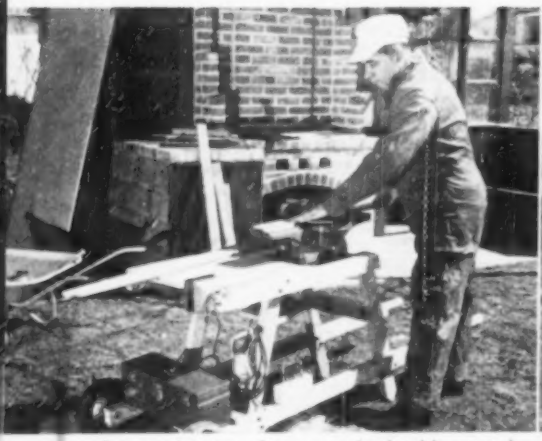
Motor of jointercart is bolted to ¾" plywood base that's hinged to crosspiece. Motor is offset for balance. Hook is for extension cord.

View from front of jointercart shows accessories. Drill chuck fits in metal loop and handle fits over hook so drill can't fall off.



Circular saw is centered on and bolted to pair of 2" by 3" crosspieces. When cart is moved, miter gauge hangs on nail in right front leg.





Jointer in use. Because infeed table extends beyond cart frame, handles are 26" from grip end to leg—8" longer than on sawcart.

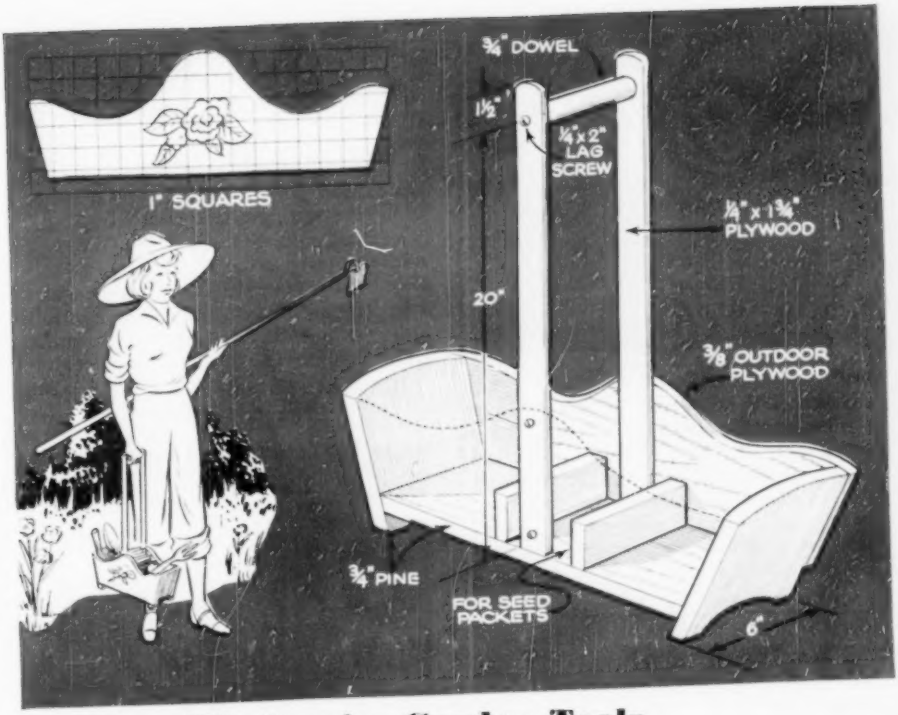
Vise on corner of jointercart worktable is handy accessory. Since jointer isn't flush with side of frame, vise can handle long work.

Saw in use. Even on hard surface like concrete walk, both units are heavy enough, and have legs spaced sufficiently, to be completely stable.

Triple outlet on leg of jointercart saves trouble of disconnecting and connecting main extension cord when drill is used.

the carts are moved. Holes for the axles—½" by 5" carriage bolts—are centered 1¼" from the ends of the handles. The wheels are attached with nuts, washers, and lock washers. From the wheel end of the handle to the front of the front leg is 13" measured along the top of the handle. Measured from the points along the center of the legs, the distance from the ground to the bottom of the handle is 5¾" on the front leg and 7½" on the rear leg.

Besides the handy worktable of ¾" plywood, the jointercart is fitted with a vise, electric drill, rack for bits, and a toolbox. To avoid running more than one extension line to the job and still have all the tools plugged in for instant use, a triple outlet is screwed to one side of the jointercart. With this outlet plugged into the extension cord, the saw and other tools can be hooked into the triple outlet. The motor of the jointer is offset to balance the cart and to allow a free space below the jointer for the chips to drop through. To avoid poor motor performance from voltage drop, use the huskiest extension cord you can get. END



No-Stoop Kit Carries Garden Tools

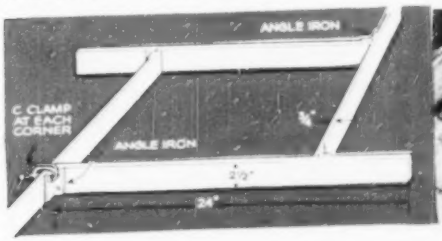
CARRY small garden tools in a kit like this and you won't have to stoop over so often to pick up implements when you move from one spot to another. Besides space for several tools, the kit also has a compartment for packets of garden seeds. The drawing gives you all the construction details. Put the parts together with wood screws and glue, paint the kit lemon yellow, and add decals for decorations.—*Hi Sibley, Nuevo, Calif.*

Make Cement Stepping Stones in Your Back Yard

HERE'S an adjustable form you can use to make stepping stones up to 22" square. You can make plain blocks or you can make them in different colors. The drawing below shows you how to build the frame. A C clamp at each corner lets you adjust the four sides to desired size.

Mix three parts of sand to one part cement. Add just enough water so the mixture will hold together when squeezed in your hand. In another box, mix a smaller batch in the same proportions. Into the second batch add dry mineral color. Mix the sand, cement, and color until it is the desired shade. Then add water.

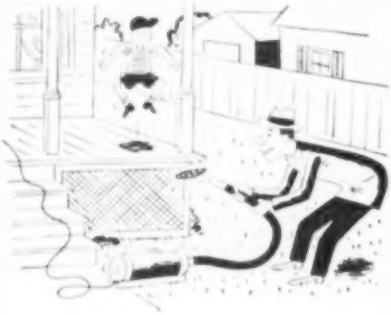
Fill the frame to about ½" from the top with the gray cement. Finish filling it with the colored cement. Smooth it off with a wood float. If the cement is tamped hard and the mixture fairly stiff, the frame can be removed soon after the block is made.—*Dick Hutchinson, El Monte, Calif.*



Tabs Improve Drafting Kit

SMALL cloth tabs stapled or glued in your drafting kit will speed removal of stubborn instruments. Fasten one end of the tab at the edge of the groove that holds the instrument. Lay the instrument over the tab so the free end of the tab sticks up on the other side. To remove the instrument, pull on the free end.—*Don Pittwood, Moscow, Idaho.*

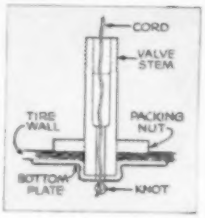
The Height of Ingenuity



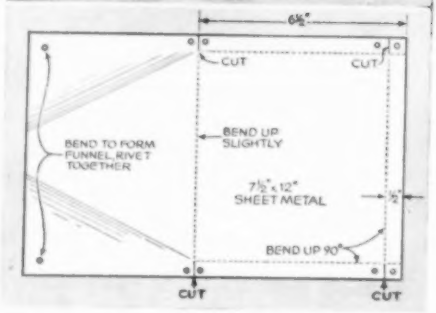
I got tired of yellow jackets zooming out of their nest under the porch and power diving on me. Here's the way I got rid of the whole gang.

While someone else jumped up and down on the porch to stir up the wasps, I stuck the nozzle of my tank-type vacuum cleaner near the nest. I neatly collected the whole swarm and then let the vacuum suck up some DDT powder.—Jack Frederick, Bloomsbury, N. J.

Installing Tubeless-Tire Valve

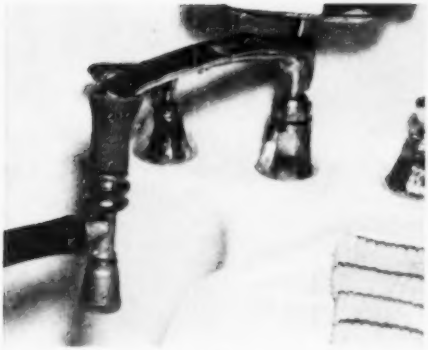


A DEFECTIVE valve in a bicycle or other tubeless tire is easily replaced by the method shown. Before forcing the bottom plate through the hole in the tire wall, put in a knotted cord as indicated. You can then hold the bottom plate in position against the inner side of the tire while you screw in the valve stem and tighten down the packing nut. Then cut the cord short and let it drop inside the tire. It won't do any harm.—*H. J. Bradshaw, Bradenton, Fla.*



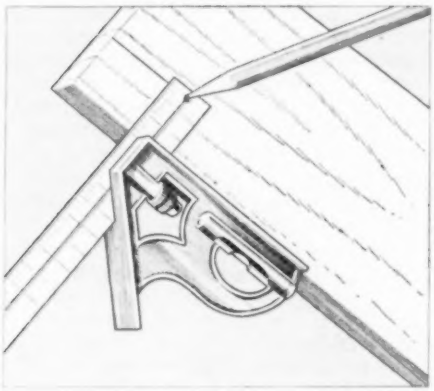
Funnel Is Sorting Tray

ONE piece of light sheet metal, galvanized iron or aluminum, is all you need to make this handy sorting tray and funnel. Snip the sheet to 7½" by 12" size. Mark the cuts and sharp bends with a scratch awl. After bending as indicated, fasten with small tinner's rivets. Rivet to the flat end a ¾" by 2½" tab of sheet metal, drilling a large hole in the outer end so the funnel tray can be hung on the wall. Smooth all edges with a file.—*Claude Sessions, Waynesville, Ill.*



Siphon Hose Fills or Drains

With this device attached to a faucet, you can fill or drain heavy tubs or cans without lifting them. All you do is turn on the water and then twist the valve to the right to fill or to the left to empty. Water running from the faucet sets up siphoning pressure to empty containers. The device can be used to drain flooded cellars or small pools. It's priced at about $4 by the Metalace Corp., New York City.



Square Doubles as Scribe

Your combination square can be used as an accurate scribing tool. Near one or both ends of the steel rule, drill a small hole to take the point of an awl, pencil, or nail. To use the scribe, press the straight side of the combination head against the edge of the work, set and lock the steel rule, and move the head along the edge. The point inserted in the hole will draw a line parallel to the edge as the head of the square is slid along.—*N. C. Darling, Danbury, Conn.*

Stump Burner from Oil Drum

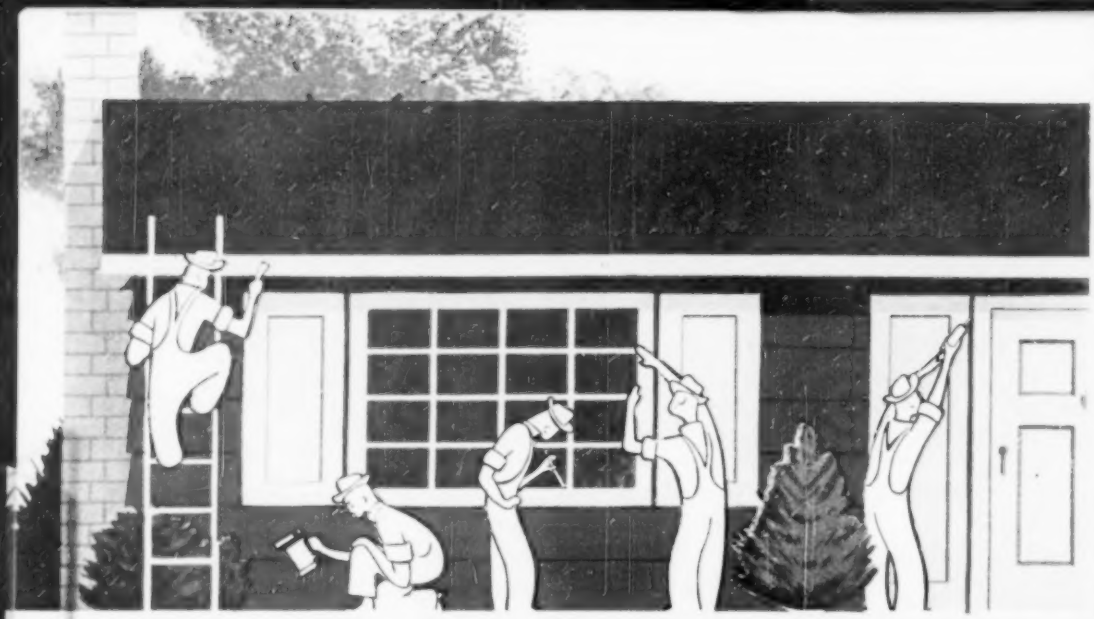
You can build an efficient stump burner with an old oil drum, pipe, and a valve. Build the stand so the drum tilts toward its opening. Curve the pipe as pictured. Adjust the valve so the oil—old crankcase drainings will do fine—drips slowly onto the stump. Once the fire is started right, it will burn for hours without attention.—*E. V. Reyner, Townsend, Mont.*

Give Your Star Drill a Rest

It's no longer necessary to drill holes in the bathroom wall to mount a towel rack or other fixture. Flat-based anchors now on the market can be stuck securely to tile, masonry, and other surfaces with a special adhesive.

Goodloe E. Moore Co., of Danville, Ill., makes its Genico Anchor Bolts especially for home use. Devices, Inc., of New York, supplies Miracle Surface Anchors with bolts, nails, hooks, and other fastenings.

They're masons. The owner of a house under construction thought they were doing a bad job of laying bricks. The contractor explained that they were scintling—laying bricks irregularly so the wall had a very rough texture for architectural contrast.



SCRAPE OFF LOOSE, BLISTERED, OR FLAKING PAINT.

USE BLOWTORCH TO REMOVE BADLY CHECKED AREAS.

CHECK ALL WINDOWS FOR LOOSE PUTTY. REPLACE IF NEEDED.

AFTER SCRAPING, DUST OUT ALL CORNERS AND CREVICES.

REPLACE CALKING AROUND DOOR AND WINDOW FRAMES.

How to Paint a House

Now's the time to dress up your home with a coat of fresh paint. Pick a dry, clear day and use good brushes and good paint.

By Bernard Gladstone

BESIDES keeping up the looks of your home, a new paint job at regular intervals is low-cost maintenance. Paint forms a durable, weatherproof film that protects wood and metal from rot and rust. And there's nothing complicated about doing your own painting. By following a few simple rules, you can turn out a really first-rate job.

If possible, do the painting during periods of mild temperature and humidity. Never paint in damp weather or right after a rain. Be sure the surface to be painted is dry and clean. Otherwise, you'll find the new paint blistering and peeling in a very short time.

Preliminaries. Before you dip a brush in a pot of paint, take care of the preparation—removing old paint that is blistered, reputtying, recalking, and removing shutters and screens. These steps are important. Painting over old paint that is blistered or peeling is a waste of time and money because the new paint will soon peel off.

Start by scraping off any loose, flaking, or peeling paint. Use a hand scraper or a stiff putty knife. Be particularly careful to remove all scaling paint and accumulated paint from window sills and other trim. Any area that is rough must be smoothed down with sandpaper or steel wool.

In some places, you may find the old film so thick and full of check marks that it is almost impossible to smooth it. In such cases, the usual method is to remove the old paint by burning it off with a blowtorch. Keep a pail of water or a fire extinguisher handy, and try to avoid charring the wood. Direct the flame horizontally and use a long-handled putty knife to keep your fingers away from the flame. Heat the old paint until it softens and blisters. Then

scrape it off right down to the raw wood.

Puttying and calking. Examine all sash for putty that has loosened or fallen out. Scrape the rabbet clean, brush on a coat of primer, and—when dry—replace the putty. Examine siding and trim for nail holes and cracks. Brush these clean and give them a coat of primer. After the primer has dried, fill in the cracks and holes with white-lead putty.

Check around all the door and window frames for calking that is loose, cracked, or missing. Replace calking where necessary. For a good job, use a calking gun. It'll squeeze the calking material out with a smooth, even pressure—forcing it well into the joints.

Where you've scraped the old paint down to the wood, seal all knots and resinous spots with a coat of shellac followed by a coat of primer. Let the primer dry at least 36 hours before painting over it.

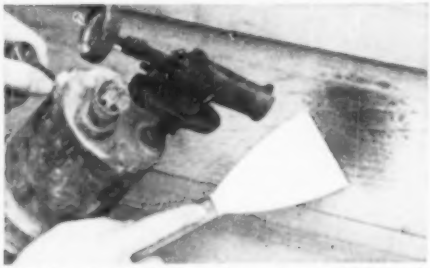
After you've smoothed and scraped the surface to be painted, use an old paint brush to whisk off all dust. The surfaces must be clean or you won't get a lasting job with the new paint.

Painting. When repainting over old work, the question of whether to put on one or two coats often comes up. Generally speaking, two coats are advisable. But if

Basic preparation step is removing old paint that is blistered, flaking, or peeling. Hook scraper is the tool for this job. Correct use of scraper is shown at right.

In close quarters, especially on sash, a stiff putty knife is sometimes better than a scraper. Flaking paint is being removed from sash in this photo.

Go over all sash carefully for cracked, loose, or missing putty. When you find putty that's in bad condition, remove it by scraping it away with a putty knife.



If old paint is thick and rough, use blowtorch to burn it off. Heat softens and blisters old paint so you can scrape it off.

Before reputtying, brush dust out of rabbet and give it a coat of primer or raw linseed oil. Apply putty smoothly and scrape off excess.

Clean out all cracks, give them a coat of primer, and fill them with white-lead putty. Nail holes also should be filled with putty.

Use a calking gun and a gun-grade calking compound to seal all cracks around door and window frames. Do this before painting.

the surface is in pretty fair condition and has not been neglected too long, one coat will often do. At any rate, don't lay on one very heavy coat and expect it to do the work of two. This may cause the finish to wrinkle on drying. The surface of a thick coat dries before the paint underneath does, resulting in uneven shrinking. If two coats are used, let the first one dry four or five days.

Start the new paint job with the siding. Begin at the highest point and work across. Don't start at a high point and paint a strip down to the foundation. Work across, climbing down to move your ladder over for the next area. By working across, you'll avoid lap marks. Never move your ladder with the pot of paint hanging on it, unless you're after low-comedy effects. Instead, bring the paint down with you.

Always be careful that the ladder feet are anchored firmly in the ground. You can check this by jumping on the bottom rung before climbing up. When you have to rest the ladder on a concrete walk or driveway, nail a rubber heel to the bottom of each leg to prevent slipping. If you use a metal ladder, make sure it's fitted with rubber-covered safety shoes.

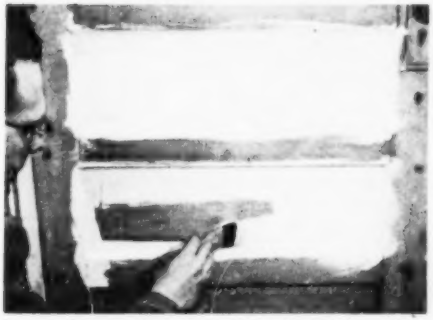
Finish painting all siding and double back to do the trim and sash. One exception to this would be a high peak where you have to paint both trim and siding. Two trips would mean a lot of extra climbing. In such a case, it's better to carry up two pots of paint—one for the siding and the other for the trim and do the job in one trip up the ladder.

If the siding of your home is clapboard, coat all the edges in any one stretch. Then paint the flat side or face, working horizontally across two or three boards at once. A 3½" or 4" brush will generally be found best for this work.

Painting trim. If your trim is to be painted a dark or bright color, it's wise to use one of the special trim paints rather than regular house paint. These trim colors are made to give a hard, glossy, nonfading surface. Ordinary house paints are designed to break down by a continuous, mild, chalking action. When washed down by rains, this action tends to leave a clean surface. Such paints are suitable for large wall areas. They're designed to eliminate the possibility of accumulating too heavy a layer of paint that'll eventually crack, or alligator, and have to be smoothed over for the next job. However, this chalking action can be ob-

When working on an extension ladder, use a pot hook to hang your can of paint. Safest type hangs can outside of ladder as shown in photo at left.

Use sash brush on sash and trim. Press down to fan the bristles out to a sharp edge as shown at right. Control brush with your forearm; not just your wrist.



Paint doors like this. Do all panels. Then coat rails, stiles, and mullions. Rails run across; stiles and mullions, vertically.

To prevent copper gutters and other fittings from oxidizing and staining trim as shown here, coat them with spar varnish.

jectionable on surfaces that must be handled—such as doors and windows. Then, too, chalking usually results in a gradual fading of colors. Using trim paint on windows, doors, and trim gives you better protection.

Painting sash. Use a 1½" or 2" sash brush. These brushes are especially made to be used edgewise. Dip half the length of the bristles into the paint. Touch the brush to the sash a little way from the edge of the glass. Twist your hand slightly to fan the bristles out to a sharp edge. Then, keeping the bristles under tension, use your whole forearm to draw the brush smoothly and steadily along the sash.

When painting paneled doors, avoid runs by always painting in the panels first. Do the rails next and the stiles and mullions last.

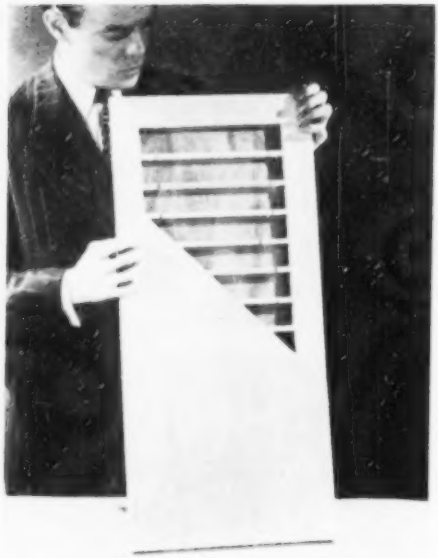
Painting metal. Copper gutters, copper screens, and other unpainted metals that oxidize often stain the trim of a house after a few rains. You can prevent further oxidation and staining by brushing the metal clean and then coating it with spar varnish.

Metal surfaces—such as railings and grates—usually are painted along with the trim. Use a wire brush to clean all rusted or peeling areas. Then spot-prime them with red lead or zinc chromate. In the case of new metalwork, brush on a coat of metal primer or zinc chromate and follow with one or two coats of trim paint.

Galvanized metals should first be washed down with a metal wash to etch the surface so the first coat of paint will stick. If possible, buy a ready-mixed wash. Otherwise, use a half-and-half solution of vinegar and water, rinse with plenty of water, and let the metal dry before painting.

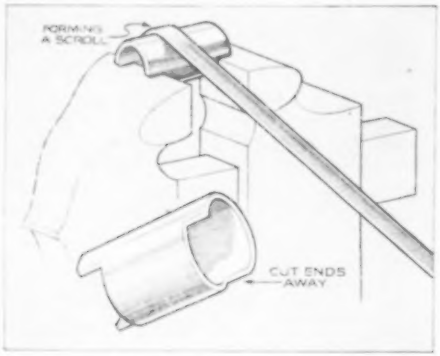
When the job is done. Before you put the brushes away, wash them in three or four rinses of turpentine until thoroughly clean. Then comb the bristles straight and wrap the brushes carefully in heavy paper to preserve their shape.

Leftover paint should be poured back into the can from which it came. Then pour a little turpentine into the can, running it down the side so it floats on top the paint. Seal the can tightly. The turpentine floating on the top of the paint will keep it from skinning over for some time. END



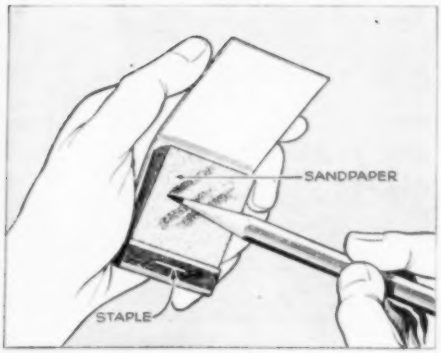
Cupboard Door Resists Warp

HARDWOOD plywood facings, bonded to a frame of low-density wood, make this door warp-resistant. The low-density wood is relatively inert and less subject to warp and twist. Ventilation keeps the interior of the door dry. The doors are made by the Wisconsin Laminating Co., of Chilton, Wis.



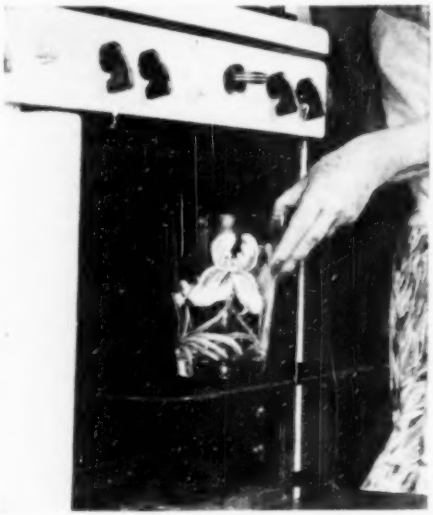
Stakes Made from Pipe

WITH a few pieces of pipe and a hacksaw, you can make your own metal-working stakes. For each size cut off half of each end of a 4" or 5" length of sturdy pipe. When you insert the shouldered ends in the jaws of your vise you have an inexpensive stake for shaping decorative strap iron.—*J. D. McCorkindale, Ames, Iowa.*



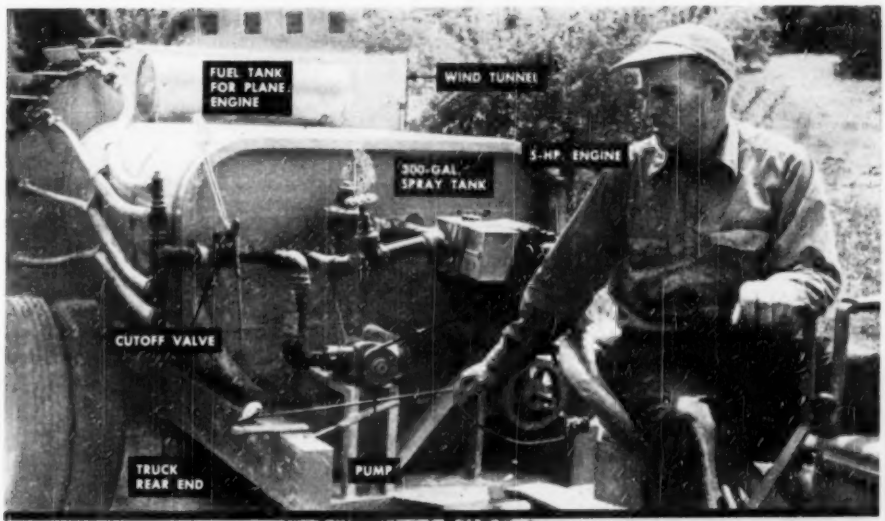
Matchbook Pencil Pointer

A CONVENIENT accessory for your drawing board or sketching pad is this little book of sandpaper. Cut six to 10 pieces of fine sandpaper to fit an empty matchbook. Run a narrow line of glue along one end of the pieces and stack them up to dry. Remove the staple, insert the glued edge and restaple.—*H. E. Carter, Noblesville, Ind.*



New Paints Stick to China

LIQUID-PLASTIC glazes let you paint designs on china, glass, and metal, which then can be baked on in the kitchen oven. About an hour's baking at a temperature of 250° makes the designs permanent. Della Robbia, one of the new paints, is made by Sculpture House, of New York City. Dek-All, another such paint, is made by the American Crayon Co.



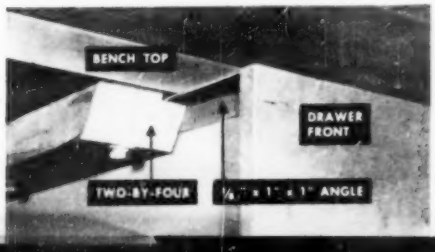
Airplane-Engine Blower Sprays Orchard Fast

When Howard L. Jenkins sprays his orchards near Chester, N. H., with this homemade outfit, he must keep three engines going. One runs the tractor, a 5-hp., air-cooled job does the pumping, and a rebuilt 40-hp. Continental airplane engine, driving a sawed-off, four-blade propeller, blows spray into the trees.

A 300-gal. spray tank is mounted on a dual-tired truck rear end as above. Behind it is a sheet-metal wind tunnel containing the plane engine and prop in one end, and eight tiers of atomizing nozzles in the other. Photo at right above shows how the pump feeds spray to the nozzles through four lengths of ¾" hose. Metal vanes between the nozzles regulate the elevation of the spray. Riding the tractor, one man can operate the sprayer, which Jenkins claims does a job twice as fast as the usual commercial sprayer.

Workbench Drawer Slides on Angle-Iron Strips

Angle iron provides a husky method of mounting a drawer under a workbench. The photo shows how to do it. Attached to each side of the drawer, the ⅛" by 1" by 1" angle iron slides in a 3/16" by 1" rabbet cut in two-by-four supports bolted under the bench. The drawer is ideal for heavy tools. —*J. C. Magee, Schenectady, N. Y.*



How to Use Tin Snips

Right- or left-hand? The gag about the left-hand wrench has whiskers, but the boss who asks for left-hand aircraft snips isn't kidding. Here is a left-hand pair, but you could use them in either hand. Do you know why?

Cutting an inside circle. After scribing the circle on the material, place the sheet on a wood block and make two crossing cuts with a cold chisel. Turn over the sheet, pry up the cut material, and snip it out. Then turn the sheet right side up and cut from the hole to the guide line in a spiral path, above right. Follow the scribed line with very short cuts.

PROPERLY used and cared for, a good pair of snips should last for years in the home shop. Here are some pointers:

Always cut with the handles at right angles to the metal. Slanting makes cutting difficult and may spring the blades.

In beginning a cut, line up the upper blade with the scribed line and hold the grips a little above the plane of the work. To avoid scratching a polished surface, you can tape the blade "shoulder" that may touch the work.

Grip one handle in vise if you're using big snips to cut heavy stock. This gives better control and makes snips easier to handle.

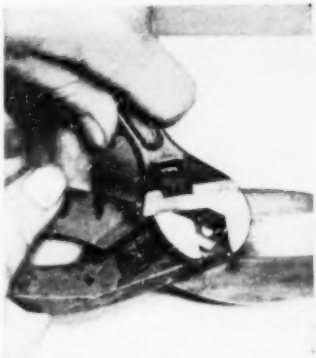
Make it a rule to close the blades part way before making a cut. A Douglas Aircraft instruction booklet notes one possible exception, however. With duckbill snips, it's permissible to cut at the base of the blades to get full leverage on heavy stock.

While cutting, use even pressure and take short strokes, especially on curves. When very strong leverage is required, rest the snips on the bench and bear down on the upper handle. An alternative is the vise setup shown at left below. Never force the cut by hammering the handles.

Snips come in four major types: the regular pattern, for straight cutting only; the combination pattern, for straight and curved cuts; curved-blade snips, for cutting curves only; and aviation snips, for cutting curves, straight lines, and intricate designs.

Regular and combination snips are often similar in appearance, but the blades of the latter are ground in such a way that curves

Oil and adjust snips at regular intervals. Use a machine-bearing lubricant. If blades are too tight, snips cut hard. If too loose, they chew metal. To adjust, pull the nut tight, then back it off slightly. Carefully used, snips will cut well for a long time without sharpening. If you try to sharpen them, be sure to keep original bevel angle on the blades.



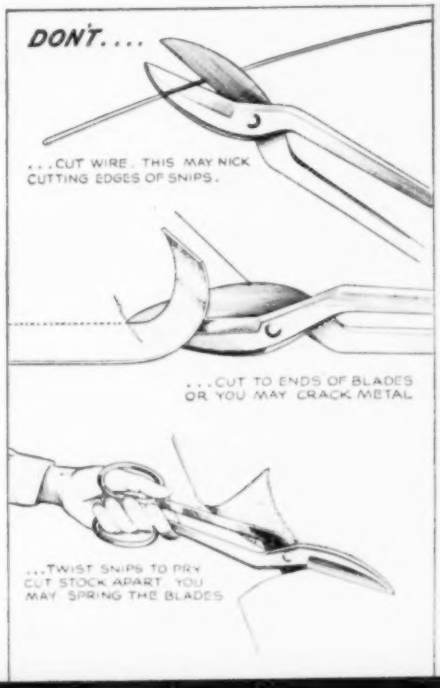
Cutting a disk. After scribing the circle, cut the corners from the material so the strip of waste will be narrow enough to roll out of the way. Then slant in to the guide line, as seen in the center photo. If the waste strip gets in the way, snip it off, as at right, leaving a stub to guide the blades to their previous path as you begin cutting scribed line again.

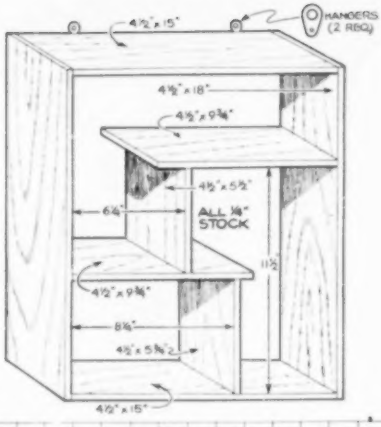
can be cut. In curved-blade snips, the blades are curved to the side. To use them, you turn the blades so that they curve in the direction of the curved line that you have scribed.

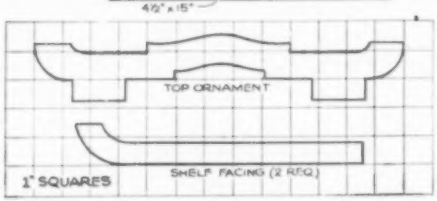
Aircraft snips, pictured at the top of the facing page, give tremendous cutting power because of their compound leverage. Serrated jaws prevent slipping. A strong spring forces the jaws apart, a hook or loop being provided to keep them closed.

With some compound-lever snips, you can cut both right- and left-hand curves, depending on which way you turn them in your hand. Others, however, are designed for one-direction cuts and are called right- or left-hand snips. Right-hand snips cut curves to the right, that is, clockwise; left-hand snips in the other direction.

You can use each type in either hand. You are holding them properly when the blades curve up slightly, like a spoon. END







Hand Tools Make Chinese Shelf

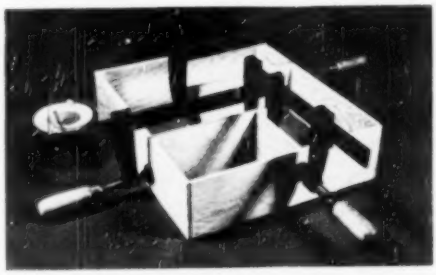
THIS Chinese modern wall shelf for figurines or knickknacks looks like a much heavier and more complicated job than it is. Actually, it's a hand-tool job, made of ¾" plywood. Only simple butt joints are used. The ¼" by ½" facing around the sides and on the shelves and shelf supports gives the appearance of heavier pieces of wood.

After you cut the parts to size, assemble three of the sides—not the top—with brads and glue. Leaving the top off allows the inner assembly to be inserted and bradded more easily. Assemble the shelves and supports as one unit and fasten them in place with glue and brads. Then attach the top of the box.

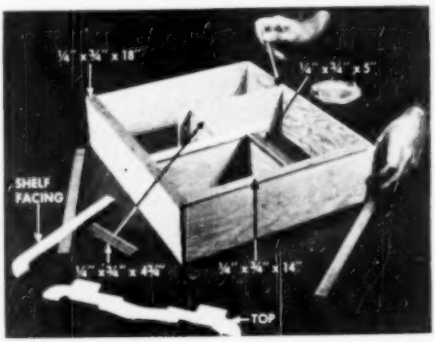
Use a coping saw to cut out the top ornament and glue it and the facings in place. Glue triangular blocks behind the ornament to give it added strength. After the glue has set, sand all parts smooth.

On the cabinet shown here, the outer surfaces of the four sides and the framing pieces were finished with black enamel. The interior was given two coats of Chinese red.

If you use fir plywood, you can get an unusual finish by going over the outer surfaces of the four sides with a wire wheel. This will remove the soft parts of the wood, leaving a roughened texture. Give these surfaces a thin coat of white paint or enamel and wipe it off before it has set. Some of the white will remain, giving a weathered appearance much the same as driftwood.—*Whitney K. Towers, Los Angeles.*



The two shelves and their supports are assembled as one unit and glued and bradded into the outer section. This shows clamp setup.



Glue is applied to the front edges of the shelves, the shelf supports, and the four sides. The framing pieces are then clamped in place.

You Will Soon See Panels Made out of Chips

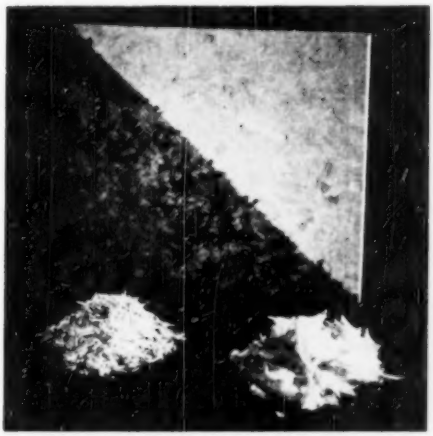
Dimensional stability of new panel is good. These blinds are tied together at top and the sections pivot on pins in bottom and top.

A NEW wood panel made of wood chips and shavings and from one quarter to a third cheaper than the cheapest plywood is scheduled to be on the market by the end of this year. The new product, called Novoply, can be sawed, planed, drilled, nailed, and otherwise worked with ordinary woodworking tools. It can be painted, varnished, or given other finishes.

The core of the panel is wood chips. The two outer layers are wood shavings. Waste wood that makes up the panel is treated with a synthetic resin and then pressed at 200 p.s.i. under heat to form panels 4′ by 8′ and 6′ by 12′ up to 1¾″ thick. Because it can be worked into curves, the product has been used in Europe in furniture manufacturing. It makes a solid, warp-resistant base for veneers.

Besides the low cost, the new panel—called Novopan in Switzerland where it has been fabricated commercially since 1947—is good on two sides, has no grain rise, and will not burn readily.

The U. S. Plywood Corp. expects the first plant at Orangeburg, S. C., to produce between 40 and 50 million feet a year. At present the product is not for outdoor use although weatherproof panels have been fabricated experimentally.

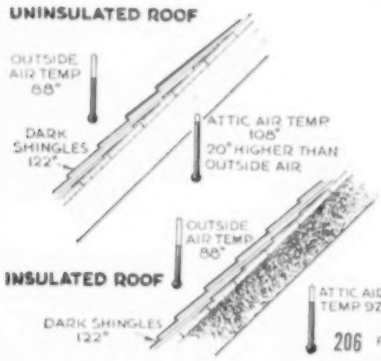


Wood chips, left, form core of Novoply. Shavings, right, make up surfaces. Oak stain was applied to the dark half of the panel.

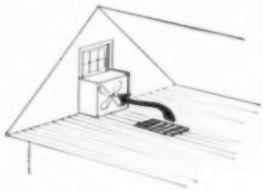
Some of the treatments Novoply can be given are shown here. Panels of different waste have different color but similar characteristics.

You Can Be

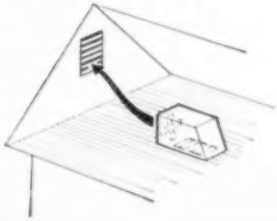
The difference between an insulated and an uninsulated roof can mean as much as 11° in attic temperatures. Dead-air space in an unventilated attic acts as an efficient heat trap.



Attic fans can be mounted in two ways—at the attic window or louvered vent, or over an exhaust vent in the attic floor. If roof has air leaks, the latter position is the better.



FAN MOUNTED DIRECTLY AT ATTIC VENT EFFICIENT ONLY IF ATTIC IS TIGHT AND HAS NO AIR LEAKS AROUND EAVES



IN MOST HOMES, FAN WILL WORK BEST IF IT IS MOUNTED IN HOUSING OVER CEILING VENT

COOLER This Summer

There are plenty of simple tricks that you can use to keep your home more comfortable during hot weather.

By George H. Waltz, Jr.
Drawings by Sigman-Ward

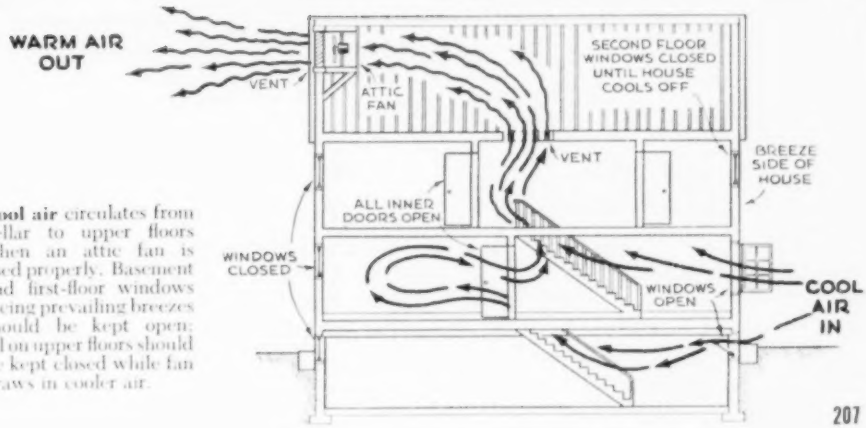
THERE'S no reason why your house cannot be cooler this summer. And there's no reason why you should spend a stack of money for the added comfort. Careful planning plus ingenuity can reduce the cost to a few dollars and a little week-end work.

The way to keep a house cool is 1) to shut the blistering heat from the summer sun out of your rooms during the day, and 2) to take advantage of the usual nighttime drop in temperature. The things you can do to accomplish this range all the way from planting shrubs to building a room cooler.

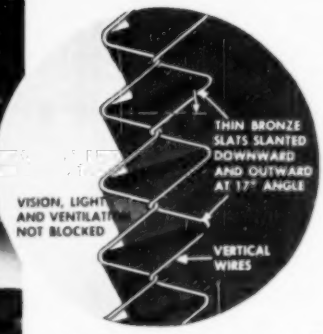
The first thing to do is *study your house*. How is it situated with respect to the generally prevailing summer breezes? Which windows get the full brunt of the summer sun? Does it have a full cellar, with cellar windows? Is the roof insulated? Are the walls insulated? Is the attic closed or well ventilated?

Most American houses, unfortunately, are highly efficient heat traps. Once the ceilings, walls, and furnishings are thoroughly warmed in summer, they tend to hold the heat. By remaining warm, they prevent our bodies from losing heat—and we perspire and lose sleep—even though there may be cool air just outside the windows. The remedy is to get your house as cool as you can at night and then try to keep it that way as long as you can the next day.

Summer heat sneaks into a house mainly through the roof and the glass in windows. If you can barricade, even partially,



Cool air circulates from cellar to upper floors when an attic fan is used properly. Basement and first-floor windows facing prevailing breezes should be kept open; all on upper floors should be kept closed while fan draws in cooler air.



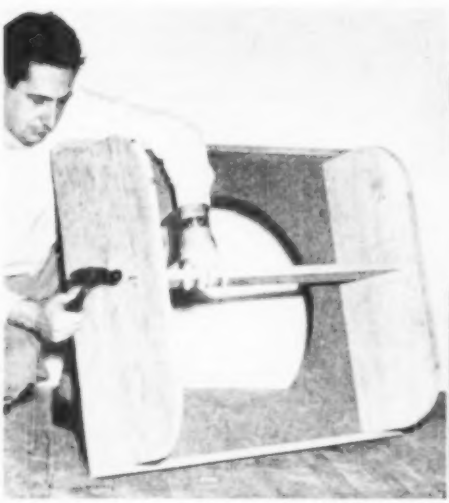
Special window screens will keep out direct rays, as well as insects, without interfering with view. Tiny horizontal slats placed at angle stop rays. Photo at left shows how sunlight passes unscreened window but is blocked by slats.

those two highways for heat, you can keep more than two-thirds of the added heat from the rays of a summer sun from getting in.

How to Keep Heat Out

Roof or attic-floor insulation, naturally, is one way to keep heat from coming in through the ceiling. Most of us think of insulation only as a means of saving fuel in the winter, but it also can help make us more comfortable in the summer. The insulating materials available range from metal foil to glass fiber. You can install some kinds yourself; others require a professional's skill.

Quite a few things can be done about your windows. All of them, especially those on the sunny side of the house, should be kept closed during the day. Glass transmits about 85 percent of the heat that strikes it, though, so something more should be done. One old stand-by is to pull down the shades. This may slow down the heat-transfer process slightly, and help psychologically by keeping out the bright light. However, such experts as Dr. H. E. Landsberg of the U. S. Government Research and Development



You can make a window ventilator from some lumber, a fan and arbor, a motor, and a few square feet of metal grille. Frame is made of 1" lumber, back, from composition board.

Fan and motor should be bolted in place. Rubber mountings are best. A 20" fan with 2½" pulley driven by 1/6 hp. motor with 1½" pulley will circulate air in small house.

Board say it is far less effective than preventing the sun's rays from reaching the outer surface of the glass in the first place. Dr. Landsberg recommends old-fashioned shutters (painted white on both inner and outer surfaces) as one of the best barriers.

Canvas awnings, particularly ones with open sides that allow air to circulate, also do a good job. The same goes for decorative architectural overhangs and window trellises covered with climbing vines.

Nowadays, you can also obtain heat-reflecting insect screens. They consist of thin strips of bronze or plastic that slant downward and outward. Thus they allow for light, ventilation, and a view, but prevent direct rays from the sun, as well as insects, from getting into the room.

How to Let Heat Escape

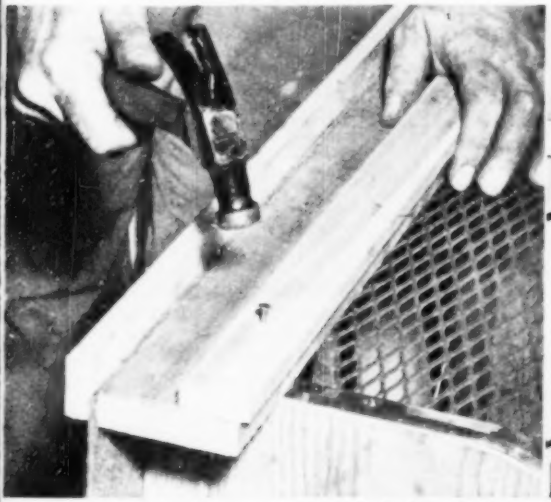
With roof and sunny windows well taken care of, your next step should be to provide an exit for heat that slips into your house despite your vigilance. This can be done by treating your house as though it were a chimney. Because hot air rises, the cellar normally will be the coolest spot in your house; the attic the hottest. It is not uncommon for the temperature in an unventilated attic under an uninsulated roof in midsummer to soar to 160° when it is only 90° outside. Such attic temperatures have much the same effect as a network of radiant-heating coils in your ceiling.

Your whole house will be cooler if you open the cellar windows that face the cooler, shadier side of your house, and ventilate your attic either by opening a window or installing ventilation louvers on the downwind side. Every little breeze that blows will then pull hot air out of the attic. How big should the window or louvers be? The experts recommend at least 30 sq. in. of opening for every 100 sq. ft. of attic floor.

Once your attic has some sort of ventilator, you will have an open top to your "chimney." Then, by keeping open all inside doors, including the cellar and attic doors, you can create a natural upward draft that will draw the warm air off from the top of the house and suck cooler air up from the cellar. This natural cooling system is generally most effective after the sun has gone down and outdoor temperatures start down.

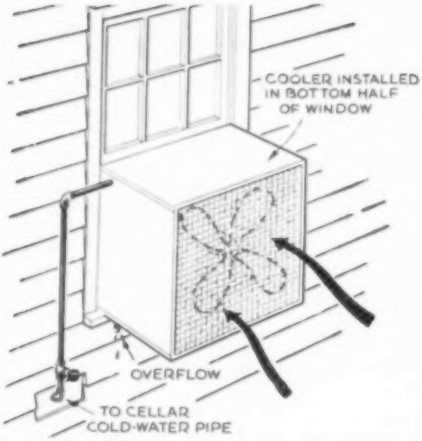
How to Shove Heat Out

You can increase the efficiency of your cellar-to-attic air-circulating system by inducing forced draft with an attic exhaust fan. Turned on a few hours every evening, it will pull cool air in through the cellar and ground-floor windows, circulate it through the house via the stair well, and expel through the attic ventilator. Soon

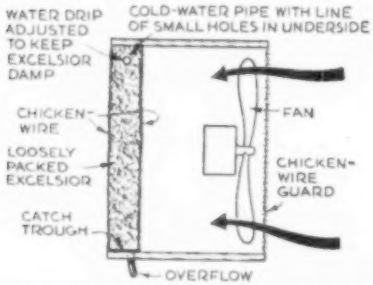


Metal grille, sometimes called "expanded metal," makes a good cover for the fan. Only the thinner gauges should be used, since the heavier gauges are difficult to work by hand.

The completed fan is held in place by the window sash itself. The fan housing is simply slipped into the window, as shown, and the sash is pulled down to grip the upper edge.



Evaporating water will help cool your bedroom if you build this window unit—a variation of a cooler improvised for many wartime barracks.



Fan blows air through filter of excelsior, which is continuously moistened by water dripping from pipe. Evaporation cools the incoming air.

the temperature of the walls, ceilings, and furnishings will be lowered. An attic fan can make a dent of as much as 15° in night-time indoor temperatures, which can mean the difference between sleeping or not.

The fan can be mounted either right at the attic window or ventilator, or over an exhaust grille placed in the attic floor. If entrance to your attic is through a trap door, it can serve as the attic-floor exhaust vent. In either case, the fan should be mounted in a comparatively airtight housing.

The size of the fan you need depends on the size of your home and its geographic location. In the middle coastal states, about 30 air changes every hour are required to cool a house down to outdoor evening temperatures. In the broiling south, you may need as many as 50 or 60 air changes an hour. In the north, ten may be ample. These figures assume that you'll run the fan two or three hours every evening.

Determine the over-all cubic-foot capacity of your house, multiply that figure by the required number of air changes per hour, and divide by 60 to get the minimum cubic-foot-per-minute capacity that your fan should have. If you live where 20 air changes an hour are recommended, for example, and your house has 9,000 cu. ft. of space, you simply multiply 9,000 by 20 and divide by 60 to get a required air movement of 3,000 cu. ft. per min.

Try the Fan Test

If you are dubious about the value of such a cellar-to-attic ventilating system, experiment first with any fair-sized electric fan. Some warm night—that is, warm indoors and cooler outdoors—open the door to your attic, place the fan so that it will blow toward an open attic window, and let it run for four or five hours—or for the entire night. Even the relatively small amount of air that a small fan can push (the average room fan doesn't move much more than 900 cu. ft. per min.) is likely to make a noticeable difference.

Just as important as figuring the size of your attic fan is gauging the size of the exhaust opening in the attic floor or trap door. Allow about 2 sq. ft. of exhaust opening for every 1,000 cu. ft. per min. of fan capacity.

Although, at first glance, it would seem reasonable to suppose that a practical room cooler could be made from a secondhand mechanical refrigerator, this is rarely the case. A good room cooler, to provide adequate cooling, should be able to deliver about ½ ton of refrigeration; a big refrigerator (10 cu. ft.) gives only about 1/6 ton. (A "ton" of refrigeration is the cooling effect of a ton of ice melting in 24 hours.)

However, if you live in a part of the country where the over-all humidity in the summer is relatively low and where tap water is plentiful, you can borrow a trick from the Army. More than one uninsulated, wooden barrack that fringed World War II airfields in Arizona, New Mexico, and eastern California—which Bob Hope called "runways built in ovens"—was cooled at night with an improvised air conditioner. It consisted of a large electric fan mounted in a window housing that blew air on excelsior kept damp by dripping water. If you buy secondhand parts, the whole business shouldn't cost you more than $10 or $20. END

Bookcase Lamp for End Table

THIS reading lamp packs its own ammunition. It holds reading matter as well as a light right up next to your easy chair. You can make this space-saver from four pieces of ¾" or ¾" lumber. Saw the stock to the dimensions shown and round off the upper corners of the upright members.

The next step is to drill a ¼" hole lengthwise through the 9" upright. Some ¼" drills are long enough to reach half way through from both ends. If yours isn't, use a long-shaft electrician's drill. Sight carefully along the drill as you work and keep the drill straight or you may find the point coming through the side. As an aid in sighting, you can clamp on a vertical strip of wood and keep the drill parallel to it.

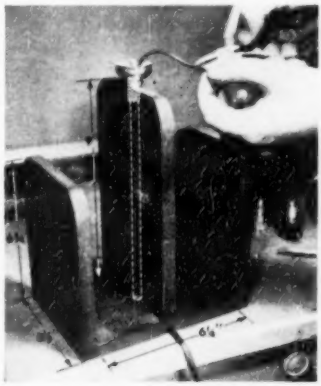
Mark and drill a hole in the base to correspond with the hole in the upright and groove the bottom of the base. Glue and nail the ends and center to the base.

Enlarge the top of the upright hole, squeeze in a few drops of glue or cement, and thread in a short ¼" pipe nipple, which is actually about ¾" o. d. Leave about ½" of the pipe exposed on top so that the base of the lamp socket can be screwed down over it.

Ease a length of lamp cord through the hole and wire the socket and plug. Cement cardboard or felt to the base to protect the table surface and to keep the lamp cord inside its groove.

Lamp wire passes through a ¼" hole that runs through the base and center upright. The base is grooved from the center to one edge to clear the wire.

The socket is attached by means of threaded pipe nipple. Part of it is turned down into the wood, part sticks up and is screwed into the socket.



Restoring Scratched Linoleum

AREAS of your kitchen linoleum that have become scratched or marred can be improved in appearance by a little special treatment. First wash them. After they've dried, rub thoroughly with boiled linseed oil. Remove excess oil, allow to dry at least 48 hours, wash again, and apply a couple coats of wax. Hard wax, rubbed to a high polish, will give a satisfactory and durable finish.

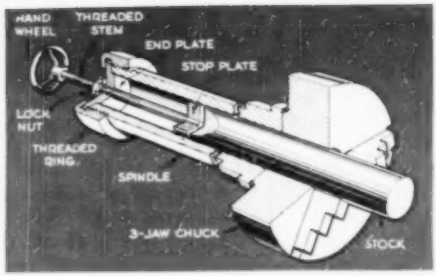
Shade Conceals Cellar Shelves

AN UNSIGHTLY but necessary collection of soap boxes, polishes, and other household articles on shelves at the head of the cellar stairs spoils the appearance of a finished basement. A quick, simple, and inexpensive remedy is a 29-cent window shade, installed between the studs supporting the shelves. Pulled down, it conceals everything.—*Robert Hertzberg, Queens, N.Y.*

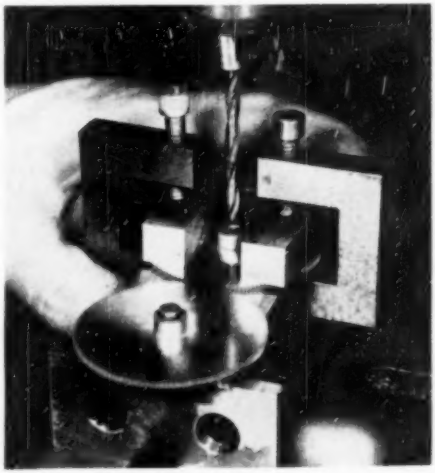
Rigid Boring-Bar Mount. The bar holder is often responsible for chattering when heavy boring cuts are taken on a small lathe. Here is a really substantial holder. It consists of two steel blocks, the lower one exactly as high as the distance from the top of the compound to lathe-center height. Clamp the blocks together to drill bolt holes through, and mark both for use in the same position as drilled.

Make a shoe to fit into the tool-post slot and tap for the clamping bolts. With the blocks tightly clamped and at 90° to the lathe bed, put a drill in the chuck and run the carriage up to make the hole for the boring bar. If bars aren't held tightly, dress off the meeting faces of the blocks on emery cloth.—*Joseph Tracy, Manhattan, N.Y.*

Pulls Screws. In the aircraft factory where I work we often have to get out Phillips screws having stripped slots, in which a Phillips screwdriver won't hold. We do it by drilling both ends of one slot at 45°, and using as big an ordinary screwdriver as will fit, sometimes tapping it in lightly. I've never seen this dodge fail.—*Kenneth W. Mallison, Pacoima, Calif.*

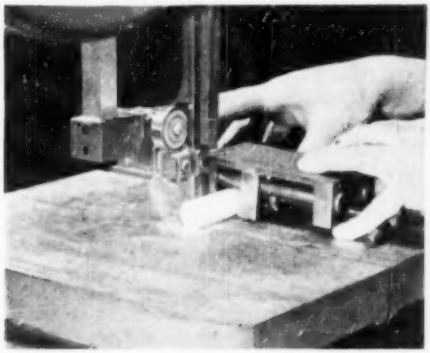


Spindle Stop Gauges Length. When work on limited production runs has to be held to close length limits, a carriage stop, plus the inside spindle stop shown, makes accuracy automatic. Reported by Herman Thoensen of E. Moline, Ill., in Warner & Swasey Company's *Blue Chips*, the device is being used on a saddle-type turret lathe. Work is pushed in against the stop, the chuck tightened, and the end faced or shoulders turned to set lengths with automatic precision by the turret tools.

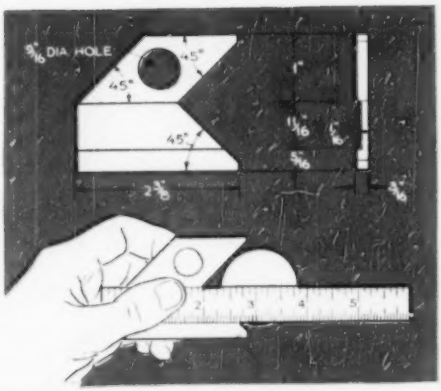


Gear Spots Its Own Center. When two or more gears are to be mounted, the critical job of locating them in proper mesh can be done with the gears. Mount the first on its shaft or pin. Then mesh the second with it and clamp this one. With a drill the same size as the hole in the gear, spot the mounting hole through it. If the gears are to go between two plates, clamp the plates together temporarily, with the gears outside for spotting.—*J. C. Magee, Schenectady, N.Y.*

Razor-Blade Gauges. By miking razor blades, you can collect an assortment of thicknesses for feeler gauges. Grind off the cutting edges, mark the thickness on each blade, and mount them on a bolt and nut.—*Federico Strasser, Santiago, Chile.*

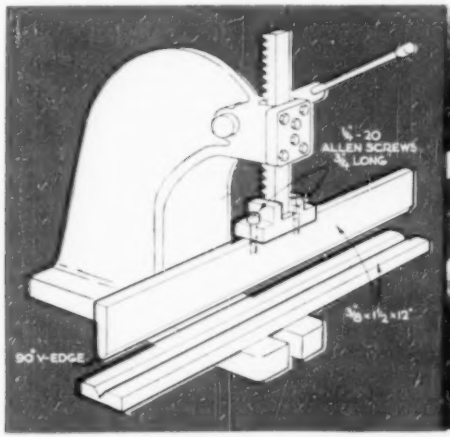


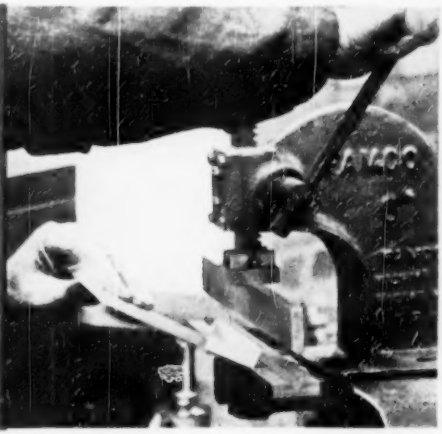
Holding Round Stock. If round work is allowed to roll on a bandsaw, it may strip off teeth, spoil the cut, or hurt the worker. To guard against this, clamp the work in a drill-press vise turned upside down, as shown. Short work can be held with a toolmaker's clamp held flat on the table.—*Arthur R. Morgan, Naugatuck, Conn.*



Tool Locates Centers. You'll find this gadget handy for spotting centers on round or square stock, as well as for squaring lines from an edge. A regular 6" steel rule fits into the groove. It's held by the thumb, while the tip of the forefinger in the hole supports the gauge.

Cut the groove first, in a piece of stock 3/16" by 2" by 2⅜", on a shaper or by filing. Then lay out the sides of the notch at 45° to the edges. Hacksaw roughly to shape. File to the lines and drill a 9/16" hole as shown in the drawing above.—*H. L. Campbell, Oak Park, Ill.*





Press Bends Sheet Metal. With a V blade mounted on the arbor or spindle, and a V block on the table, any arbor or drill press becomes a small sheet-metal bending brake. An adapter machined as in the drawing secures the V blade on an arbor press. For a drill press, bore a tapered hole in the adapter to fit the spindle, or butt the adapter against the end of the quill.

To form small boxes by turning all four sides up around a bottom, or for other bends in tight quarters, substitute shorter V blades that will fit within any bends already made. —*Samuel J. Kutner, New Rochelle, N.Y.*

What Plastic Is That?

Simple kitchen-table tests identify wonder materials of our Age of Plastics

By Howard Nechamkin
Assistant Professor of Chemistry, School of Engineering, Pratt Institute
Photos by Kenneth M. Swezey

ACRYLATE, acetate, neoprene, styrene—maybe these are all Greek to you. But they belong to a new language, not an ancient one—the new language of the Age of Plastics.

Boil down a hundred and some trade names, and you'll find they designate about 18 kinds of plastics. You can identify these by home tests, and so determine whether an ornament can safely be washed in hot water, or a broken toy mended with a hot soldering iron, or lacquer thinner can be put in a container without dissolving it.

Originally considered substitutes, plastics are the dream stuff of modern industry. Want something that's transparent but unshatterable? A silk-sheer fiber with the tensile strength of iron wire? A "rubber" hose that will carry gasoline and stand heat? You can have them all—in plastics.

What's confusing is that the same plastic may be known by half a dozen trade names. The term Bakelite, on the other hand, can refer to any of four plastics. That's why it's best to know plastics by their chemical names.

All plastics belong to one of two main classes: thermoplastic and thermosetting. The chief difference is shown on the facing page.

Because heat will soften thermoplastics, some of them can be repaired by welding breaks together with heat. Thermoplastics can also be "cemented" with a suitable solvent that softens the joining surfaces and allows them to flow together. Solvents won't soften thermosetting plastics, but these can be patched together with certain cements.

Let's look at the plastics line-up, some of the trade names they go by, and a few of their uses.

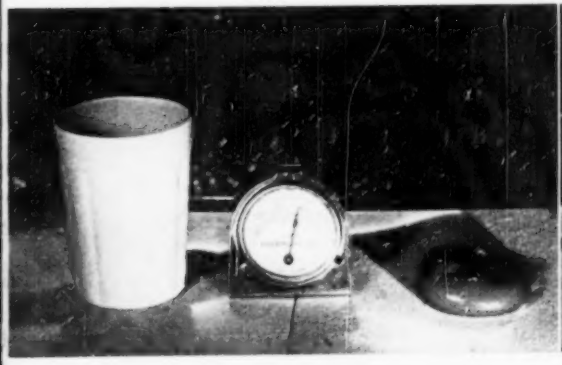
Phenolics (thermosetting), most widely used of all plastics, are made by combining phenol (carbolic acid) with formaldehyde. They're hard, resistant to heat, water, and many chemicals, and are generally made in dark colors. Telephone instruments, electric plugs, and camera cases are made of phenolics. Trade names: Bakelite, Catalin, Durez, Gemstone, Indur, Marblette, Resinox, Uniplast.

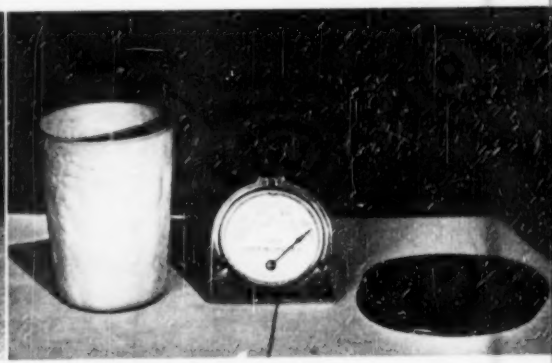
Urea plastics (thermosetting) are made by reacting formaldehyde with urea, a compound of ammonia and carbon dioxide. Like phenolics, they're resistant to heat, water, and chemicals, but can be made in any color, including white. They are used for buttons, baking enamels, kitchenware, and certain

You can separate plastics into two main classes. *Thermoplastic* ones can be melted and recast again and again. *Thermosetting* plastics retain the shape they originally were molded in and cannot be melted and recast. Both have their advantages.

These pictures show the difference. The cup at the left in each photo is made of melamine, a thermosetting type. The one at the right is of polystyrene, a thermoplastic. At about the temperature of boiling water (photo at right above) the polystyrene cup softens and begins to collapse. The other is unaffected. In photo at left below, at 375° the thermoplastic has become a blob. The melamine cup is beginning to blister and discolor.

At 550° (very hot baking oven) the polystyrene is a puddle. Though badly blistered, the thermosetting material retains its shape.





adhesives. Trade names: Bakelite, Beetle, Gemlite, Plaskon, Rhonite, and Sylplast.

Melamines (thermosetting) come from formaldehyde and melamine, a synthetic organic chemical. They too can be produced in beautiful light colors, and have very hard surfaces, excellent electrical properties, and great water resistance. Melamines are used for airplane and tractor ignition parts, circuit breakers, dishes, and buttons. Trade names: Catalin Melamine, Melmac, and Plaskon Melamine.

Acetate or cellulose acetate (thermoplastic) is made from wood. It does not burn readily, is resistant to shock and impact, and may be produced in transparent colors. You will find it in soap dishes, steering wheels, safety film, eyeglass frames, toys, and lacquers. Trade names: Acetate Rayon, Bakelite, Berkalm, Celluplastic, Clearsite, Kodapak, Lumarith, Nixonite, Tenite I, and Vuepak.

Acetobutyrate (thermoplastic) is very much like acetate, but more resistant to water and shrinkage and more easily molded. It can be made transparent or any color, and finds use in toothbrush handles, instrument dials, and radio cases. Trade names: Rexenite, Rextrude, and Tenite II.

Nitrate (thermoplastic), also known as pyroxylin, is one of the oldest plastics. Made from wood or paper, it is extremely tough, water resistant, easily fabricated and colored. One great disadvantage is that it's highly combustible and tends to burst into flame if brought even near fire. For this reason, acetate has largely replaced nitrate. However, nitrate is used in tool handles, pens

No flame at all. The sample retains its shape.

Sample burns but goes out when removed from flame. Return it just to edge of flame and note color characteristics it imparts.

Sample keeps on burning after removal from flame. Try to judge flame color during the first second that it's burning.

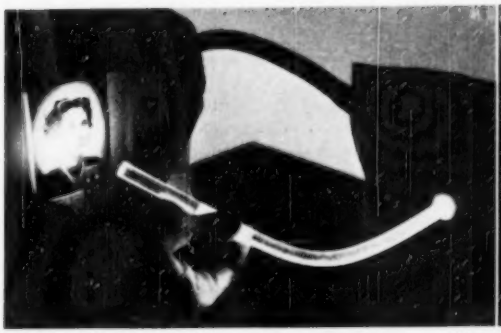
How to Make Match Tests

CUT or shave off a small piece of the plastic. Holding it in tweezers, let it barely touch the match flame. If it doesn't take fire, hold it there for not more than 10 seconds. Note the color it imparts to the flame. If it does burn, note its own flame color. After ten seconds, blow the flame out, smell the fumes given off by the smoldering plastic, and locate flame color and odor on the chart at right.

Tests should be made where there is no draft to disperse the odor. Don't blow out the match along with the plastic, or the match smell will confuse you. A Bunsen burner is better because its flame is less luminous and it has no odor.

Five of the plastics appear twice in the table because their flame color changes after the first few moments of burning. Test some known samples if possible before tackling unknown ones.

COLOR AND NATURE OF FLAME	ODOR OF SMOLDERING PLASTIC	TYPE OF PLASTIC
	formaldehyde	UREA
	formaldehyde plus fishlike odor	MELAMINE
	formaldehyde plus carbolic acid	PHENOLIC
pronounced green area in flame	burnt rubber	PLIOFILM
small green area with much yellow	burnt rubber	NEOPRENE
green area	acrid but not burnt rubber	VINYL
green area	sweet	VINYLIDENE
green; sparks from burning plastic	vinegar	ACETATE
intense white; burns fiercely		NITRATE
mostly blue, white tip	floral, fruity odor	ACRYLATE
blue	burning leaves or fresh celery	NYLON
mostly blue	weak, slightly sweet	FORMAL
blue; with sparks	rancid butter	ACETO-BUTYRATE
blue; no sparks	rancid butter	BUTYRAL
yellowish, bright green mantle	burnt rubber	PLIOFILM
almost colorless, purple mantle	vinegar	ACETAL
yellow-white luminous	rancid butter	ACETO-BUTYRATE
yellow-white luminous; smoky	sweet floral	STYRENE
yellow-white luminous	weak, slightly sweet	FORMAL
yellow-white luminous	burnt paper	CELLULOSE
weak; small green mantle, much yellow	burnt rubber	NEOPRENE
yellow-green mantle	vinegar	ACETATE
yellow-green mantle; burns well, once started	slight, sweet	ETHYL CELLULOSE



Piping light around corners is a curious property of acrylic. Throat illuminators, indirectly lit auto instruments, and striking window displays make use of the phenomenon.

It melts away. Cellulose acetate dissolves readily in some solvents. Acetone, for one, puts a hole right through acetate rayon. Dissolve enough, and you have lacquer or nail polish.

and pencils, watch crystals, and shoe heels. Trade names: Amer-glo, Celastic, Celluloid, Herculoid, Kodaloid, Nitron, Pyralin, and Samson.

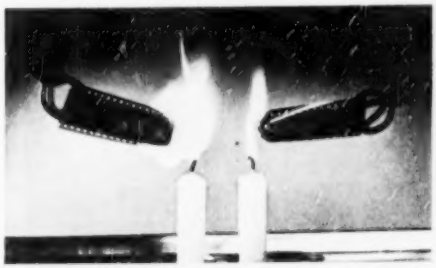
Ethyl Cellulose (thermoplastic) is made from wood and alcohol. Its best properties include low flammability, good electrical properties, acid resistance, toughness, and lightness. One of the newer plastics, it's used in airplane parts, electric appliances, wire coatings, ice trays, and hose nozzles. Trade names: Ethocel, Lumarith E.C., and Thermocast.

Cellulose (thermoplastic) is familiar under the trade name of Cellophane. Chemically it is nothing but transparent paper. What makes it so useful is its toughness in film form, plus its tastelessness and transparency. Trade names: Cellophane, Sylphrap, and, in fiber form, Rayon.

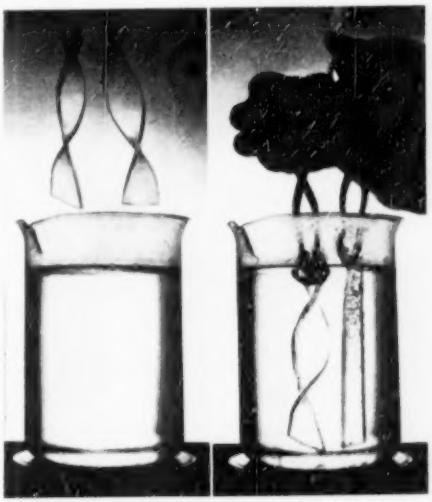
Pliofilm, a trade name, identifies a thermoplastic used as a more water-resistant packaging material. It's made from waste rubber and rubber products by treatment with hydrochloric acid gas.

Vinyl (thermoplastic) comes in the form of thin sheets and molding compounds, and may be flexible, elastic, or rigid. Vinyls are resistant to water and many chemicals, and do not burn. Things made of vinyl include suspenders and wrist-watch bands, shower curtains, raincoats, and phonograph records. Trade names: Flamenol, Koroseal, Plioflex, Vinylite, and, in fiber form, Vinyon.

Formal, Acetal, and Butyral (thermoplastic) find specific uses based upon their unique properties—toughness, moisture resistance, light and heat resistance, and ease of molding. They are used in safety glass,



They look alike, but cellulose nitrate movie film (left) burns furiously. Cellulose acetate film at right (safety film) burns almost reluctantly. This type costs more.



It "remembers." Heat a strip of polystyrene and another of acrylic, and twist both into spirals. Dropped into boiling water, the acrylic returns to strip form. Styrene stays twisted.

life rafts, army raincoats, and self-sealing gasoline tanks. Formal is called Formvar and Saflex-F; Acetal is called Alvar, and Butyral is called Butacite, Saflex, and Vinylite X.

Vinylidene plastics (thermoplastic), close relatives of the vinyls, are valuable for extreme resistance to water, solvents, concentrated acids and other chemicals, and for noncombustibility, toughness, colorability, and high tensile strength. Vinylidene has amazing wearing qualities, and therefore is used for seat covers, fishing leaders, netting, window screens, chemical pipes, clothes-lines, and hoses. Trade names: Apla, Perflex, Saran, V.E.C., and Velon.

Styrene (thermoplastic) is made by a simple chemical process starting with benzene. The crystal-clear resin can be colored any shade desired. Its resistance to water, chemicals, and electricity is excellent. Styrene is used for dishes, radio insulators, lenses, and toys. Trade names: Bakelite, Loalin, Lustron, Polyflex, and Styron.

Acrylic plastics (thermoplastic) sometimes look very much like and are very frequently mistaken for styrene. But the acrylates range from soft sticky liquids to very hard thermoplastics. They have excellent transparency and colorability, weather resistance, lightness, and the strange property of piping light around curves. Acrylic is so easily colored to match gums and teeth that dentures are made of it. Uses include aircraft windows, lenses, safety goggles, musical reeds, and displays. Trade names: Acryloid, Crystolex, Lucite, Plexiglas, and Vernonite.

Nylon (thermoplastic) is familiar for its use in women's hose. But that's a minor application. Nylon can have a tensile strength of 58,000 pounds per square inch. Parachutes, tennis-racket strings, toothbrush bristles, fishing line, paint brushes, surgical thread, gears, and electrical switch parts are made of Nylon. It has no other name.

Neoprene (thermoplastic) is a trade name for polychloroprene, one of the first substitutes for rubber. Made by a completely synthetic process from two gases—chlorine and another similar to acetylene—it closely resembles rubber but is far superior in resistance to sunlight, oxygen, heat, oils, and solvents. It's used for flexible gas and oil hoses, electrical insulation and sockets, shoe soles, and military balloons. END

The Height of Ingenuity

There's one house-cleaning job I never liked: Getting dirt out of corners. How do you think I do the job now?

I whittled the handle of a long, round brush until it fitted the chuck of my husband's electric drill. Now the dirt flies out of corners when I turn on the juice.—Mrs. Adeline Rhoades, Omaha, Neb.

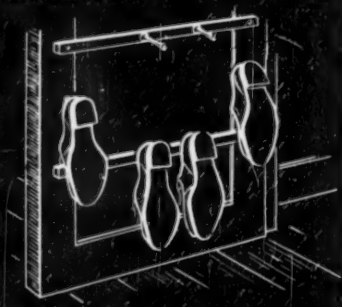
New Changer Turns Disks Over

A THREE-SPEED, fully automatic record changer that turns records over to play the second side is now available for custom installations. The player handles all sizes of records in any sequence, the only manual operations being the selection of turntable speed and rotation of the cartridge to put the desired stylus in play. A full load of long-playing records will give up to 21 hours of continuous music. A load of 78- or 45-r.p.m. disks will play up to 3½ hours. The changer is made by Lincoln Engineering Company, St. Louis, and lists for $250.

Use a Doorstop

THAT rubber-tipped finger that sticks out from the baseboard wasn't put there just to trip you up. Its job is to keep the door from banging into the wall. But it can do a lot of other jobs, too, as you can see in these sketches. A doorstop is a ready-made handle or peg and has a built-in screw so it can be attached to any piece of wood in a jiffy. For any of the applications pictured here you can use either the older wooden type of stop or the newer metal one.

Need an awl? All you have to do is file down the screw threads of a doorstop. It's a perfect tool for piercing leather, making punch marks, or scribing.

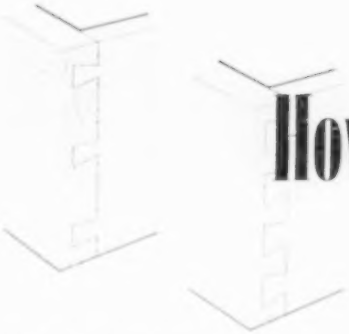


Do shoes clutter your closet floor? Here's a trick that will keep them in line. Just screw in a row of doorstops on the wall or door and hang the shoes in place.

A mortarboard is any old board with a doorstop screwed to the bottom. Use wood about ¾" thick and shorten the screw so it won't stick through the working surface.

Handles are handy on sanding blocks. A doorstop attached to a block provides a better grip, makes it easier to use. For lengthwise work, screw stops into both ends of the block. Doorstop handles of this type can be adapted to scrubbing brushes, scrapers, and the like.

Put coat hangers to full use by adding hat hangers to them. A doorstop fastened to the center of a hanger makes it a two-in-one clothing rack.



How to Make Dovetails with Power Tools

By Edwin M. Love

YOU can well be proud of a nicely fitted dovetail joint. Dovetailed drawers are a mark of fine cabinetmaking, but few craftsmen have time to fit a number of drawers by hand. Machine-made dovetails are the answer.

A drill press can be used to make perfect half-blind dovetails if you have the inexpensive jig shown. A drawer front and side are clamped in this jig, which is moved by hand against a rotating cutter. A metal comb guides it as it forms pins and sockets in both pieces simultaneously.

A circular saw, fitted with a dado head and a spacing jig, will cut plain dovetail joints requiring only a little hand trimming.

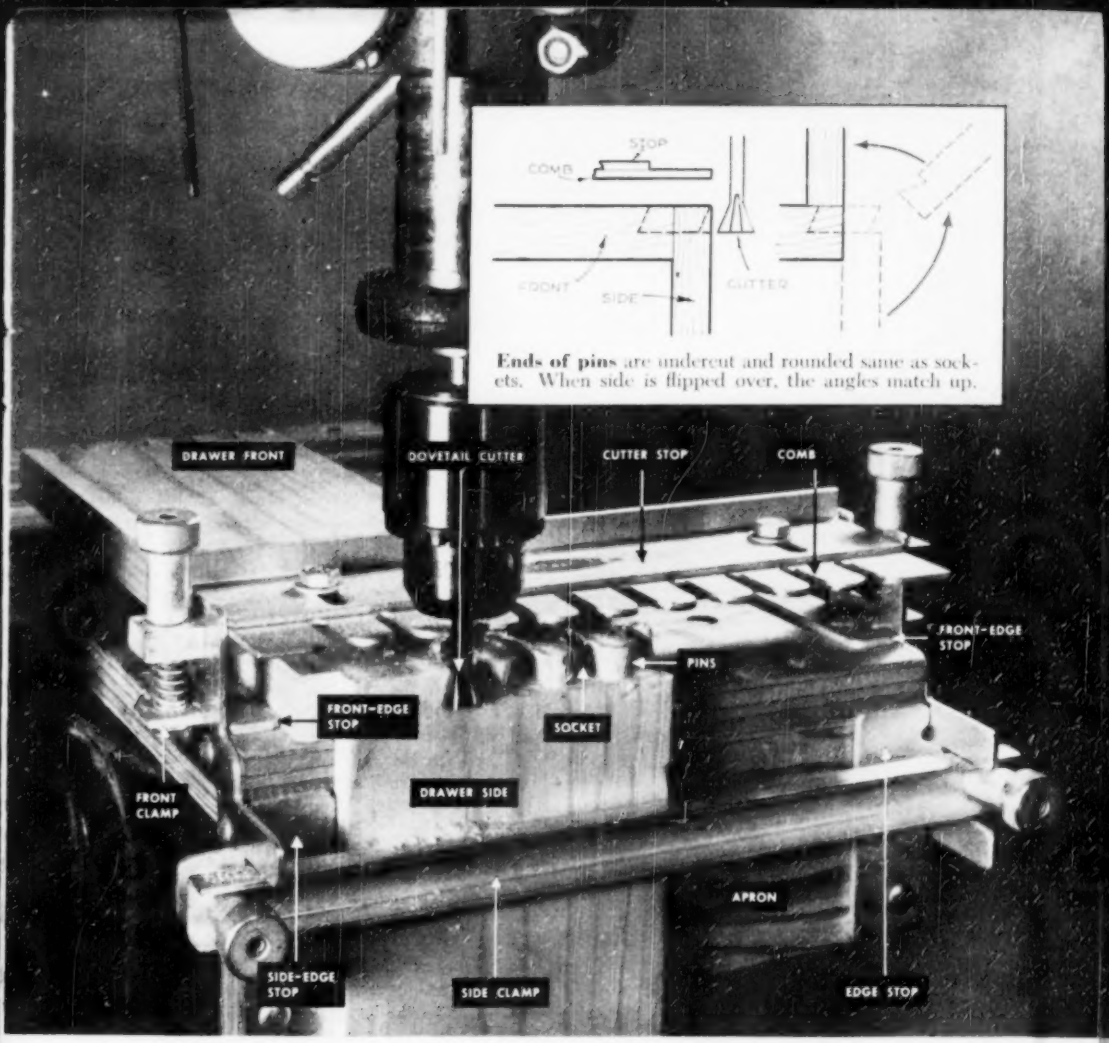
A bandsaw or jigsaw will cut various dovetails without extra equipment.

Mortises for half-lap work can be bored to depth on a drill press. This removes most of the waste, leaving less chisel work. End dovetailing is possible with a dovetail router in the drill press, or by dadoing on a circular saw.

Dovetailing attachment. This accessory slides freely on the drill-press table, which is swung to center the quill about 1" outside the end of the jig, as in the photos. The dovetail router must have cutter and shank diameters as specified for the jig, or the joint will not fit. If your drill press has a tapered spindle, use a lock-on collet.

After the drawer parts are cut square and to length, clamp the drawer front under the upper hold-down bar, its end flush with the apron of the jig, and one edge against an edge stop. Clamp a drawer side against the vertical apron of the jig, aligning its upper edge with the uppermost face of the clamped front, and butt it against the side stop. The two pieces are offset by the stops so that the spaces in both can be cut in line with each other—while on assembly, spaces will line up with pins, the edges being flush. The exposed faces will go inside the drawer.

Align the tips of the comb fingers with the exposed face of the drawer side. Then set the stop plate on top of the comb back from the tips a distance twice the thickness of the side, minus ⅛", for the jig shown. This attachment cuts pins ⅜" long and 9/16" thick, regardless of the thickness of the stock. If the drawer side is thicker than 9/16", the stop isn't used, and the comb is moved back the extra thickness to let the router shank go 7/16" back from the edge of the drawer front. The router will then cut back the pins, leaving them 9/16" thick.



Ends of pins are undercut and rounded same as sockets. When side is flipped over, the angles match up.

It's good practice to set the drawer sides in from the ends of the front, making a lip or rabbet on the latter. Then the front can be dressed to fit its opening with minimum clearance, while the sides will be set in enough to slide freely. To do this, set the router stop back twice the thickness of the side, plus the width of the rabbet, minus ¼". Cut the rabbet after the dovetails are made.

Lock the quill to make the router cut to a depth of ⅜". Shift the belt for highest speed and pull the jig against the router. The outer faces of the pins will be rounded to fit the socket ends formed by the cutter.

In cutting the opposite end of the front and its mating side, clamp both pieces at the other end of the jig, using the second pair of edge stops. Thus in a drawer with dovetail joints all around, diagonally opposite corners will be cut at the right side of the dovetailing jig, the other two at the left.

Since the dovetail spacing is fixed by the jig, the tails at the two ends will not be the same distance from the top and bottom edges unless the drawer width is scaled to suit. This can be overcome by inserting spacer strips between edges and edge stops.

Sawing through dovetails. On the circular saw, you can get a handmade effect by making the pins much wider than the sockets. Mount a dado head with spacers to cut the minimum width between the pins, and tilt the arbor or table 20°. Clamp a wood auxiliary head to the miter gauge.

run it over the blade to cut a shallow notch, and glue in a small block to project 1". Now shift the piece to the right on the miter gauge a distance equal to the desired dovetail spacing and screw it fast. In use, the saw will cut a second notch in the head.

On one of a pair of sides mark the first cut to be made. Holding both sides vertically, ends down on the table against the auxiliary head, pass them over the saw. Lift the pieces and set the cut kerf over the projecting block, make the second pass, and so on. This cuts one side of all the pins. Now turn the pieces with the opposite face against the auxiliary head, and cut the other side. Chisel out the little triangular stubs.

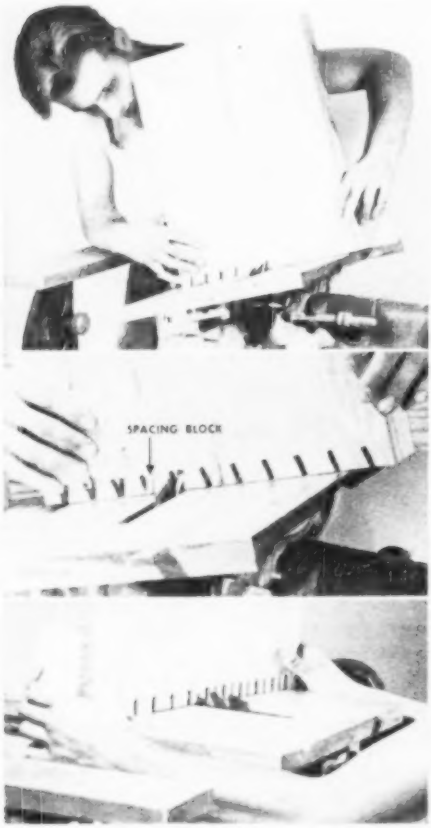
For the sockets in the mating members, the cut is made with the table or arbor level, but with the miter gauge swung to 20°. Make a second auxiliary head, clamp it on, cut a notch, and glue in a block as shown below. Use one of the sides on which pins have been cut to mark the socket spacing on the head and the first socket location on the work. Drop each cut successively on the locating block. To saw the other side, swing the miter gauge 20° the other way. Turn the auxiliary head upside down and set a new block.

Half-blind sockets can't be sawed, but most of the waste can be bored out on the drill press. Set the spindle depth gauge to stop the bit at the bottom of the socket, and chisel out the corners afterward.

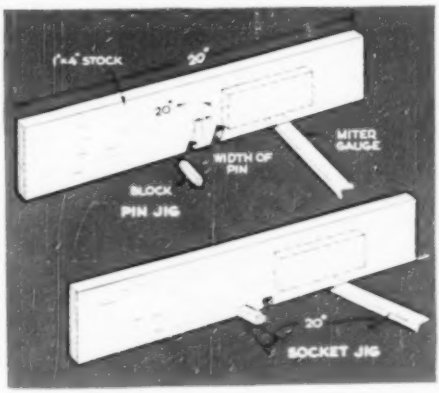
Bandsawing dovetails. The way a bandsaw can tackle thick stock makes it a natural for dovetailing several drawer sides at a time. Tack the pieces in a stack, laying out pins on the top one as for hand work. Cut the sides with a wide blade. Then bore out the waste between on the drill press. Nibble out the bottoms on the bandsaw.

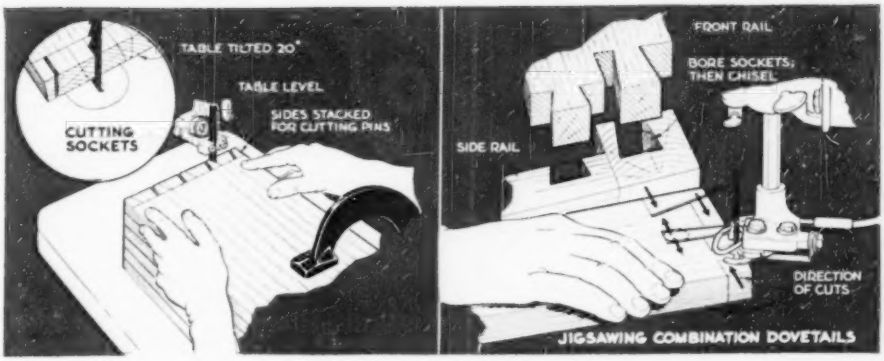
Using a sidepiece as a template, scribe the sockets on the joining piece. Tilt the bandsaw table to the required slope, and cut the sockets in one piece at a time. If the table won't tilt sufficiently in both directions, clamp on an auxiliary table, propping up one side with a block. Trim the corners of the sockets by nibbling straight in parallel to each side cut. Don't turn the work on the table, or you'll slope the bottom.

The jigsaw is, of course, used in the same way except that its capacity limits it to cutting a pair of sides at a time. Both power



After cutting one side of all pins as in the top photo, turn work 180° to cut other sides (center photo), pressing sides of new kerfs against the spacing block. Sockets are cut with the table level but miter gauge at 20°. Use a second auxiliary head (lower drawing at right) or scribe sockets from pins in joining member. In this case, standing behind saw and pulling work toward you (lower photo) gives view of lines.



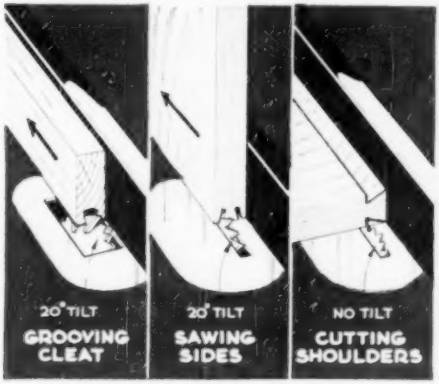


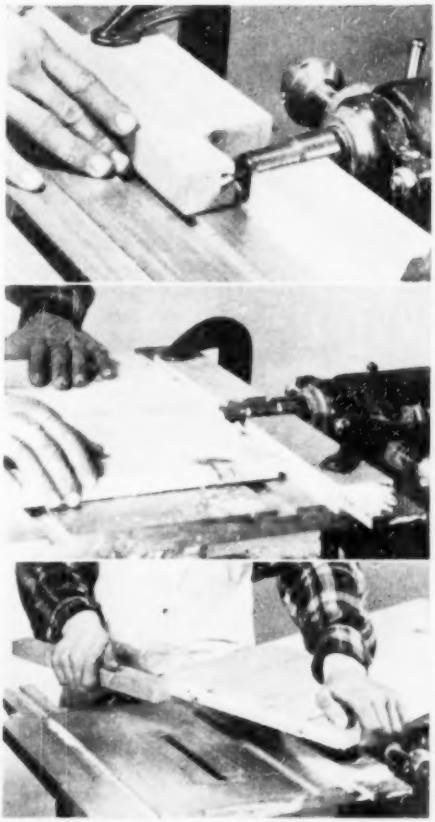
tools will make combination dovetails, as shown in the drawing, for joining posts and side panels or rails. Make cuts in the direction of the arrows in the drawing. Bore and chisel the blind sockets.

Half-lap dovetails can be made in several ways. The dovetailed end can be halved by ripping down the thickness and sawing the shoulder on a circular saw, bandsaw, or jigsaw, or by thinning it with a dado saw.

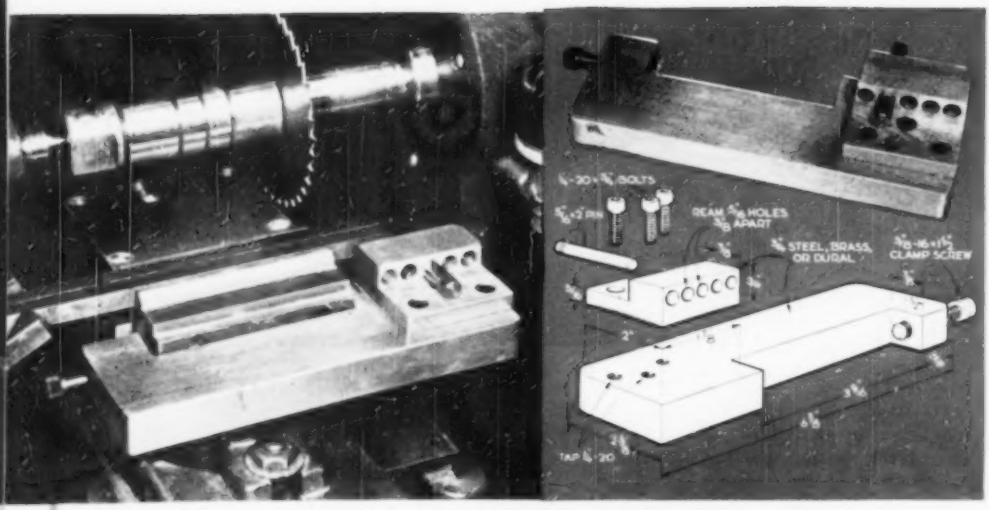
Ripping end-cleat dovetails. To form a dovetail groove in a cleat, mount a dado head, tilt the arbor or table, and run the work against the rip fence to cut one side of the groove. Turn the cleat end for end to rip the other side.

To dovetail the end of the board on which the cleat is to fit, leave the table tilted, set the fence to center the tenon correctly, and rip one cheek with a stiff blade, such as a single dado saw, as in the drawing below. Turn the opposite face of the work toward the fence to rip the other cheek. Then set the saw or table square, and with the board face down, cut the shoulders. END





A dovetail router can form end-cleat joints on a combination power tool like that above, since the saw table can be set below and outside the spindle. Clamped-on wood strips form a fence. The groove is cut as in top photo. Then the tenon is made by running work under the cutter for each cheek (second photo). If the tenon is tight, make another pass with a sheet of paper under the board. Assemble joint without glue.



Pin Gauges Cutoffs in Milling-Machine Vise

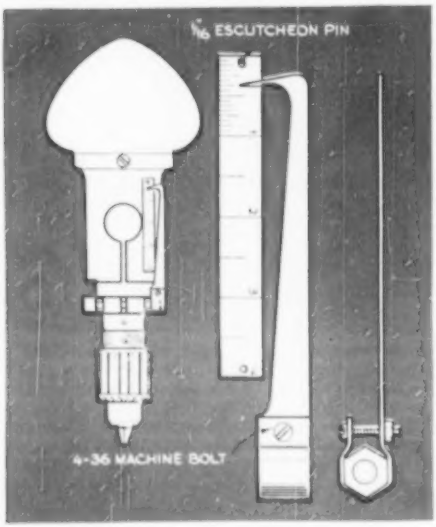
Even if only a few pieces are to be cut off in the milling machine, this gauge is worth while for the speed and accuracy it affords. It also eliminates the dangerous practice of reaching behind the cutter with a scale to set each cut.

As each piece is cut, after the stock has been pushed against the pin and the vise tightened, the pin is pulled back. The piece then falls free when cut off; it cannot jam between cutter and stop, as with fixed stops, and so break the cutter.

Dimensions given are for a 3½" milling vise. For others, change the notch dimension to suit. Mount the locating block with three small bolts. Polish the locating pin to a snug sliding fit in the reamed holes.

Besides cutoffs, the gauge is useful for many jobs that take accurate positioning in the vise.—*J. C. Magee, Schenectady, N.Y.*

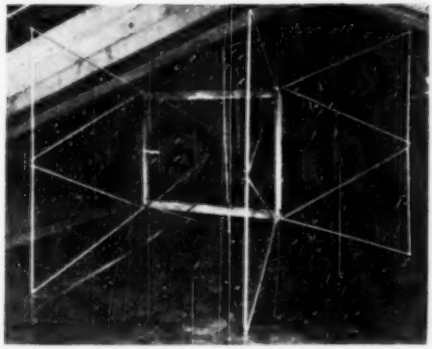
Simple Parts Add Depth Scale to Drill Press



You needn't do without a depth-drilling scale just because your drill press didn't come with one. Mount a 4" length of carpenter's rule on the drill-press head with escutcheon pins driven into undersized holes. Bend a strip of sheet metal as shown to fit around the hex nut on the clamping ring. Or, instead, drill a hole in the ring and drive in a bent piece of heavy wire for a pointer.—*Fred Strickland, Portland, Ore.*

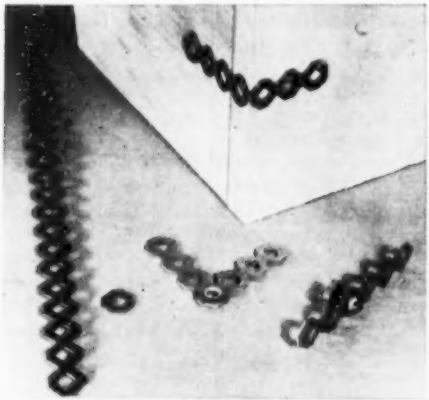
Double Setscrews Can't Loosen

The rounded setscrews used in light machinery, especially in the home shop, often loosen because of vibration. A solution that has worked fine for me is to replace the usual long setscrew with two short ones, one on top of the other. The lower one is tightened hard on the shaft. The second, tightened above it, locks both of them for keeps.—*John C. Martin, Kings Point, N.Y.*



Attic Aerial Keeps Roof Clear

A TELEVISION antenna that you can hide in your attic may work as well as one on the roof. Smoke, soot, or chemical deposits won't reduce its efficiency, and it won't mar the appearance of your home. The Attic V Beam is described by its makers, Telrex, Inc., Asbury Park, N. J., as a full-scale, high-sensitivity antenna that can be placed on the attic floor or hung from the rafters. Its arms are hinged to make it easy to put it on the beam.

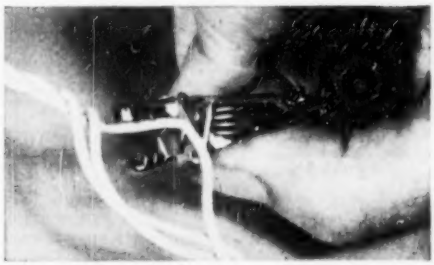


Mending Strips Speed Repairs

A VERSATILE mending strip that looks like a row of diamond-shaped holes can be used for many household repairs. Fix-O-Strips, marketed by Jayson Strips Co., Brooklyn, N. Y., can easily be broken off to any desired length or bent smoothly around corners or curves. The metal strips will join, reinforce, or support almost any type of material; the holes accommodate tacks, rivets, screws, or nails.

Recorder Works on Batteries

A COMPLETELY portable recording and playback machine weighing only 8 lb. operates on self-contained batteries. The new Walkie-Recordall, made by Miles Reproducer Co., Inc., New York, cuts sound tracks on an endless plastic film. It can record continuously for over three hours.



Clip Tooth Pierces Insulation

TEMPORARY electrical connections can be made more quickly and securely with this new Needle Clip. A sharp pin set rigidly in one jaw of the clip digs through insulation to make the electrical contact with the wire underneath. Mueller Electric Co., Cleveland, makes the device.

Make Things Obey

By building voice switches, you can cause all sorts of things to happen when you say the word.

By Karl Greif

THERE'S power in your voice. Like your hands and feet, it can be used to make many kinds of apparatus heed your wishes.

Three sound-operated switches that are easy to build and a pleasure to use are described in the three articles that follow. These devices turn words and syllables into electrical impulses that open and close relays. The result is the same as if you reached out and turned switches.

The sketch at the right shows you what happens. The microphone converts sound

This simple one-tube unit is all it takes to run a model train.

THIS one-tube voice switch will make standard remote-control locomotives of the type used in many model-train sets do what you tell them. These engines have sequence selectors that make the cars stop, start, or back up when a switch is pushed.

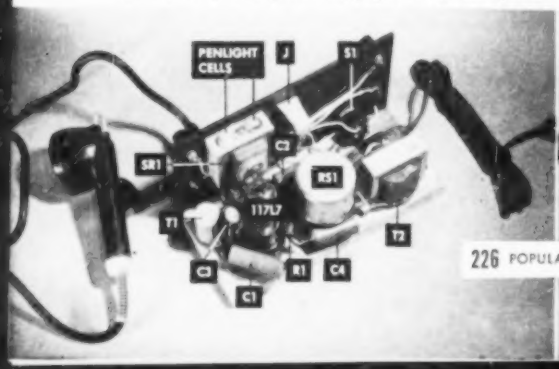
The switch momentarily breaks the flow of current to the track. Each interruption moves the selector one notch. If the train is going forward, the first interruption brings it to a halt, the next sends it into reverse, then stop, forward, stop, and so on. Since the locomotive is built to do this, the control mechanism only has to meter your speech and change sounds into pulses. Each pulse closes a relay and interrupts the current flow.

Parts for this control unit were selected for economy and simplicity. The carbon microphone, for example, is a war-surplus item still available at a low price. The 117L7 is a good tube choice because it operates directly off the line and needs no filament transformer. It also contains its own rectifier diode.

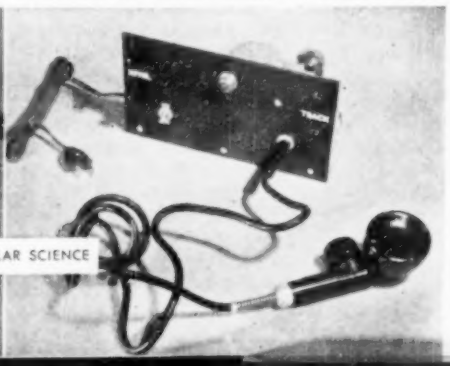
You may have to experiment a bit to find the proper connections to the output transformer, T2. This can be done after the wiring is completed and the unit is in operation. If you have a voltmeter, clip the prods across the relay coil and whistle a steady note into the microphone. Note the voltage, reverse the leads to the transformer secondary, and repeat the test. Make the final connections to whichever taps give the highest output.

A child can learn to operate this voice controller. It is connected by four wires between the train transformer and the track.

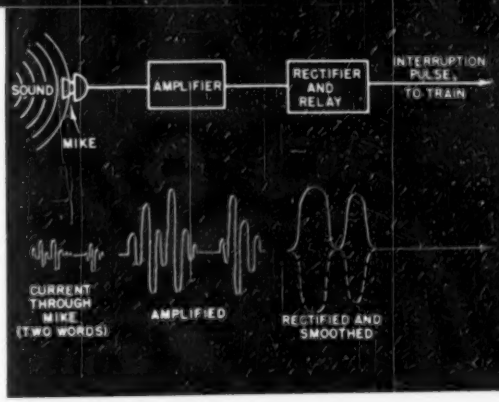
Two penlight cells in series provide the mike voltage. If the relay tends to stick, adjust the spring or put a piece of paper over the pole.



If the relay picks up when you press the talk switch on the mike, remove the switch spring and lubricate the slide with petroleum jelly.



Your Voice



into alternating current. An amplifier puts muscle into this AC signal. It then is rectified and filtered into separate pulses of direct current that are fed to a relay.

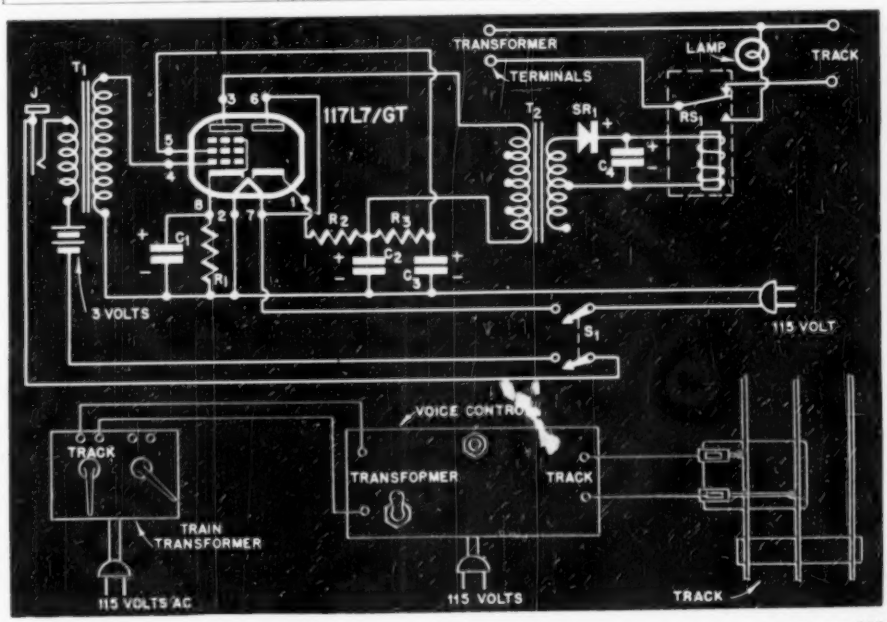
What kind of sound do you need to make a pulse? That depends on the filtering. By choosing the right components you can mold the action of the relay to respond to long or short words or syllables.

You don't have to make any changes in the train equipment. While the relay is in the up (normal) position, current flows from the train transformer to the track just as if the voice switch weren't there. But when a sound energizes the relay, the contact arm falls and interrupts the circuit.

Give yourself a practice workout with the train controller before putting it on display. By spacing such words and phrases as "Stop," "Forward," "Now go back," and the like, you can advance the selector relay one, two, three, or more steps at a time. The trains will respond to *any* sound pulse. You have to pick the right number of words to make them do as you tell them.

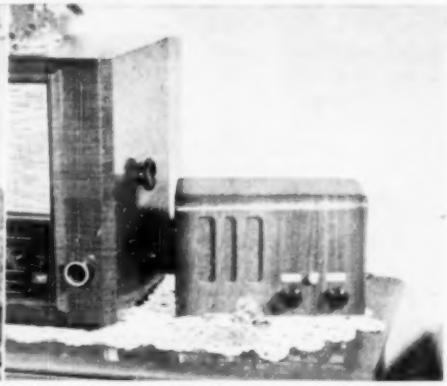
LIST OF PARTS

R1: 150-ohm, 1-watt carbon.
R2: 30-ohm, 1-watt carbon.
R3: 5,000-ohm, 1-watt carbon.
C1: 10-mfd., 25-volt electrolytic.
C2: 40-mfd., 150-volt elect.
C3: 20-mfd., 150-volt elect.
C4: 4-mfd., 50-volt elect.
T1: Single-button microphone transformer, aprox. 200-ohm pri. to 80,000-ohm sec.
T2: Output trans., 10,000-ohm pri. to 2,500-ohm sec.
RS1: 2,500-ohm SPDT plate-circuit relay.
SR1: 50-ma. dry-disk rectifier.
S1: DPST toggle.
J: Single-button microphone jack.
Indicator lamp (same voltage as train set), breadboard chassis, panel, dial-light assembly, carbon mike (T-17 or other).

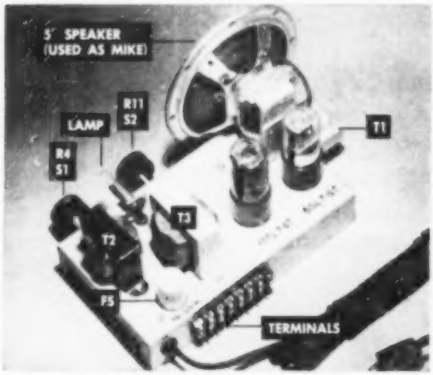


Here's a robot that will turn off radio commercials for you.

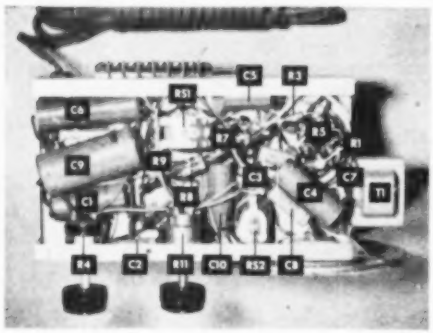
Connected to a bell and placed beside the baby's crib, this sound switch will set off a remote alarm whenever the baby cries.



Connected to a radio, this box silences commercials on your spoken command. The radio will come on again after a period of quiet.



When using the timer circuit, turn on S2 before setting the sensitivity control. Otherwise the click of the switch might trip the relay.



If you want the momentary contacts on RS1 to stay closed longer after the trigger sound stops, use a larger condenser in place of C10.

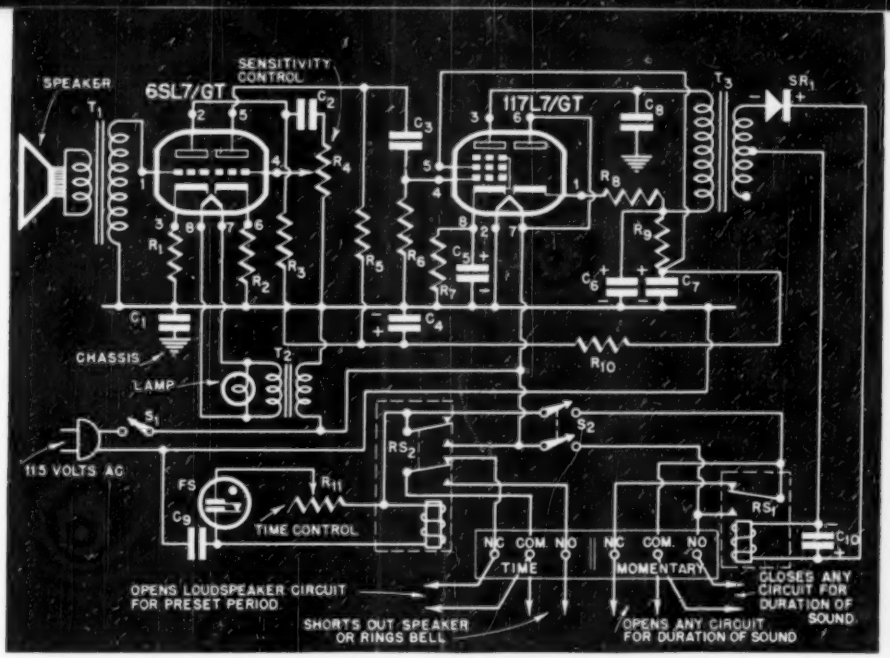
ADDING two circuits to the basic voice switch described on the previous pages will make it more versatile. With the electronic package pictured above, you can turn off the radio during commercials without going near it. All you do is call "Quiet!" or even "Shaddup!" and the radio will be mute for about 45 seconds. A second use of the same device warns you in a distant part of the house whenever the baby cries.

One of the additional circuits is a timer that stretches out the switch action; the other is a preamplifier that increases sensitivity. The completed unit looks like a small radio, but in this case the speaker is used as a microphone.

The labeled photo at the left shows how the major parts are arranged. The high gain of the circuit makes their position rather critical. Note particularly that the shielded input transformer, T1, is placed at right angles to the output transformer, T3.

Two sets of terminals are attached to the rear edge of the chassis. One set provides momentary switching action, the other prolongs the action for a controlled period after the triggering sound impulse stops.

The time-delay circuit works like this: a sound picked up by the microphone-loudspeaker is turned into an electric pulse that energizes relay RS1. This relay remains picked up just long enough to close a second circuit and allow current to reach the coil of relay RS2, a 115-volt AC relay. This is wired in parallel with a fluorescent-lamp starter (FS) so any voltage that appears



LIST OF PARTS

R1: 3,000-ohm, 1-watt carbon.
R2: 2,500-ohm, 1-watt carbon.
R3: 200,000-ohm, 1-watt carbon.
R4: 500,000-ohm potentiometer.
R5: 100,000-ohm, 1-watt carbon.
R6: 500,000-ohm, ½-watt carbon.
R7: 150-ohm, 1-watt carbon.
R8: 15-ohm, 1-watt carbon.
R9: 5,000-ohm, 1-watt carbon.
R10: 3,000-ohm, 1-watt carbon.
R11: 500-ohm wire-wound pot. or rheostat.
C1: .1-mfd., 600-volt paper.
C2: .001-mfd., 400-volt paper.
C3: .003-mfd., 400-volt paper.
C4: 20-mfd., 150-volt electrolytic.
C5: 10 mfd., 25-volt elect.
C6: 40-mfd., 150-volt elect.
C7: 20-mfd., 150-volt elect.
C8: .002-mfd., 600-volt paper.
C9: 1-mfd., 600-volt paper.
C10: 4-mfd., 50-volt elect.
T1: Intercom input transformer, secondary approx. 25,000 ohms, primary to match 3 to 6-ohm voice-coil.
T2: 6.3-volt filament trans.
T3: Output trans. aprox. 10,000-ohm pri. to 2,500-ohm sec.
RS1: 2,300-ohm SPDT plate-circuit relay.
RS2: 115-volt DPDT AC relay.
SR1: 50-ma. dry-disk rectifier.
S1: SPST switch on R4.
S2: DPST switch on R11.
FS: 15-20 watt neon-type fluorescent starter.
6.3-volt pilot lamp. 5" PM speaker, 1½" by 4½" by 8" chassis.

across the relay coil also appears across the starter. When current flows through the starter, it heats the bimetal contacts and bends them till they finally touch. This lowers the voltage in the relay and ends the timing cycle. The time-control rheostat, R11, regulates the current through the starter and therefore the delay.

To use this unit as a radio silencer, connect either the normally-open (NO) time terminals across the voice coil of the radio's speaker or the normally-closed (NC) pair in series with one speaker lead. Turn on the time switch (S2) and set the time control to maximum. Then, while the radio is operating at normal volume, adjust the sensitivity control, R4. It should be below the point where the radio's sound can trigger the relay. A word or handclap will then silence the radio for about 45 seconds. It will come back on automatically.

The higher the sensitivity control is set, the easier it will be to set off the device, but if the setting is too high it may respond to loud music, or an auto horn in the street, or even vigorous conversation. Sometimes the unit may have to be mounted on sponge rubber to keep it from reacting to vibrations other than a loud voice aimed directly at it.

To use this unit as a baby tender, connect the normally-open contacts either on "time" or "momentary" (depending on whether you want a long or short alarm) to a bell. Juice for the bell can be tapped off the 6-volt pilot-light terminals. Place the control box close to the crib, and place the alarm bell wherever you wish. Now when the baby cries, his voice will make the alarm bell ring.

This device also can be used as a night watchman, to make lights turn on, to trip a camera shutter, or to start or stop household appliances. For some of these purposes, however, relays capable of handling larger loads may be needed.

Continuous-duty switch uses little power, keeps its ear cocked.

Automatic garage doors can be honked open with this sound-operated switch. Mike is cushioned on rubber, enclosed in a watertight hood.

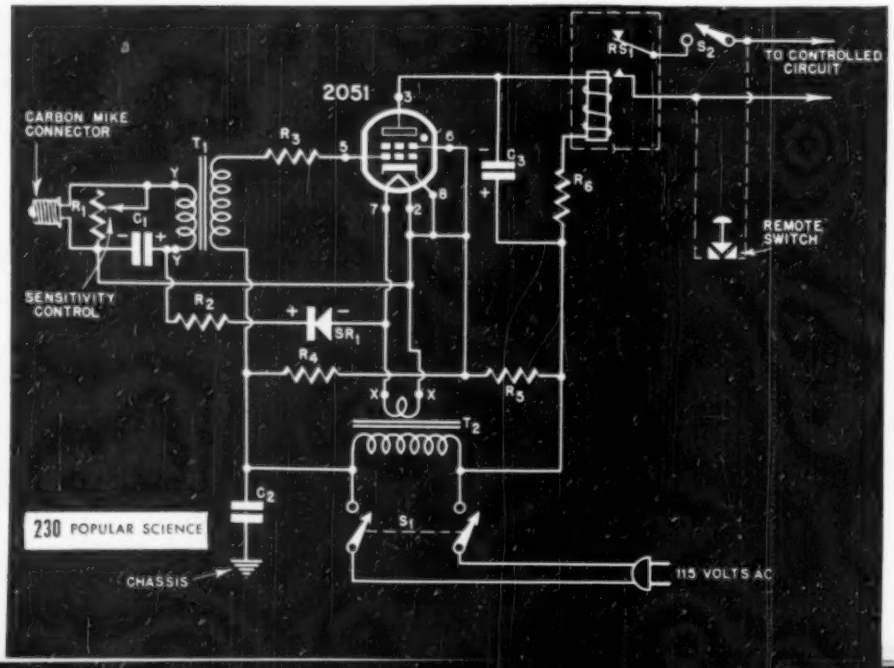
THERE are a lot of applications in which voice switches have to be left on for long periods of time. In such cases it's important that the power consumption be held to a minimum. Here's a circuit that will do it. It is built around a gas-discharge tube known as a thyratron.

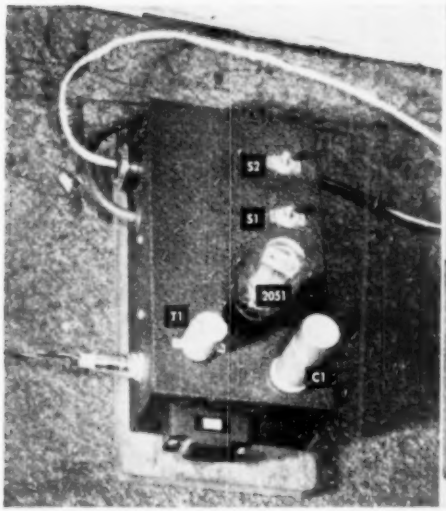
The special advantage of a thyratron is that it needs no DC and draws plate current only when triggered. In other words, the only power used in stand-by operation is the small amount needed for the filament and for the carbon microphone supply.

When a signal hits the mike, it is stepped up through transformer T1 and impressed upon the grid of the tube. Voltage on the grid makes the tube "fire." You know it's firing when you see a blue-violet glow inside the bulb. What happens, actually, is that the tube becomes conductive and starts drawing pulses of current from the AC line. The pulses energize the relay. The higher the value of the pulse-smoothing condenser, C3, the longer the relay will remain picked up after the firing in the tube stops. Higher values of R6 will also increase the time lag.

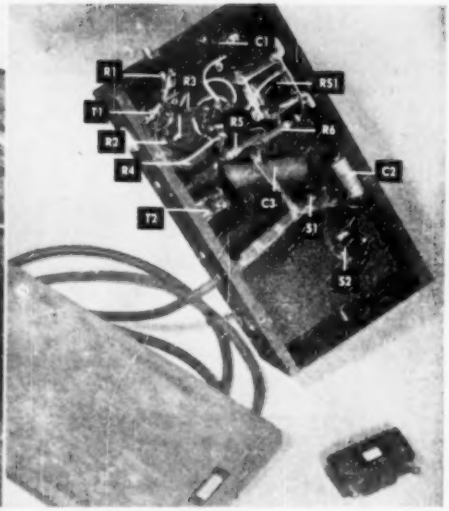
LIST OF PARTS

R1: 1,000-ohm potentiometer.
R2: 50-ohm, 1-watt carbon.
R3: 5-meg., ½-watt carbon.
R4: 500-ohm, 1-watt carbon.
R5: 25,000-ohm, 1-watt carbon.
R6: 5,000-ohm, 1-watt carbon.
C1: 100-mfd., 15-volt electrolytic.
C2: .02-mfd., 600-volt paper.
C3: 40-mfd., 150-volt elect. (8- to 100-mfd. can be used to vary closed-time of relay).
T1: Single-button mike trans. approx. 200-ohm pri. to 80,000-ohm sec.
T2: 6.3-volt filament trans.
RS1: 2,500-ohm SPST plate-circuit relay.
SR1: 30-ma. dry-disk rectifier.
S1: DPST toggle.
S2: SPST toggle.
Carbon mike, chassis, tube.





The wooden board on which the chassis rests can be screwed to a wall. The oversize chassis insures ample ventilation in tight quarters.



If the thyratron tends to fire too easily, increase the value of the bias resistor, R4; if it doesn't fire, try a smaller resistor.

The entire unit is built on a 3″ by 5″ by 10″ chassis. The only critical part of the wiring is that referred to by the letters "x–x" and "y–y" in the diagram. The position of these leads controls the phasing of hum voltage in the mike circuit. If the tube is uncontrollable or tends to pulse erratically, reverse the connections at x–x or y–y.

The single-button carbon mike shown in the photos was removed from a surplus telephone handset. For most applications it is important to mount the microphone on sponge rubber. A water-inlet hood from a washing machine was used as a protective housing for the mike.

Relay contacts are connected to the circuit to be controlled. In this case it happened to be an automatic garage-door opener. Dotted lines in the diagram show how the original control switch was connected into this circuit.

In use, the sensitivity control (R1) must be set at a fairly low point so that it will respond to an auto horn sounded four or five feet away but ignore other noises.

Another application for this control is to turn on runway and landing lights at a private or unattended airport. The mike could be mounted on a sounding-board panel and located near the runway. When a pilot "buzzed" the airport, the roar of the motor would trigger the thyratron and turn on the field lights through a heavy-duty latching relay. An automatic timing circuit would have to be added to turn the lights off after a suitable interval. Automatic turnoff is important since the circuit is necessarily subject to chance noises. END

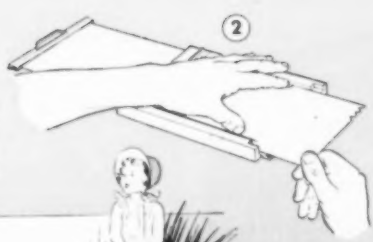
Jumping Tests Your Shocks

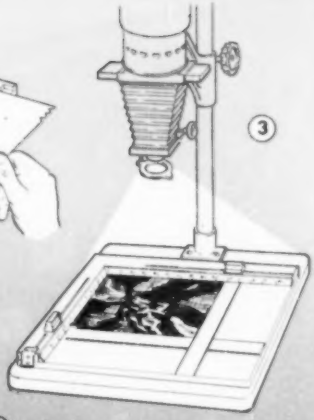
The function of automobile shock absorbers is to dampen, or slow down, the up and down movement permitted by the springs. You can test whether yours are doing their job by standing on the front bumper and bouncing the chassis up and down. If it continues to bounce excessively after you get off, the front shock absorbers need attention, perhaps replacement. Jump on the rear bumper for a similar test of the shock absorbers at that end.

Gluing Wood Controls Warping

Why is the top of a workbench usually made of several strips of wood glued together, rather than a solid piece?

There's a sound reason. Under changing climatic conditions, any wood tends to warp and split. But if the wood is sawed into strips, rearranged, and then glued together, the tendency of one part to twist out of line is counteracted by the forces exerted by the others joined to it. This is a good point to remember in any woodworking job.





WHAT'S WRONG ?

EVEN professional photographers sometimes forget to remove the lens cap or dark slide, so it's not surprising that amateurs often draw blanks. Each of these pictures shows a different way you can go wrong.

1. As every shutter bug can tell you, correct exposure is vital. That's why the proud father here is checking his with an exposure meter.

2. Some tyros load their holders this way, may even get pretty fair pictures.

3. Most photographers make their own enlargements when they want good ones. But this fellow isn't doing so well.

4. Johnny's sister made a guest appearance on a TV show. He was all ready to record the event. Did he get a good photo?

5. Our nature lover felt fine when he finally coaxed a squirrel to sit still for a portrait. But even the squirrel was disappointed with the results.

Answers

1. He's angling the exposure meter too high and holding it too far away from the child. Meter should be held closer to measure the light actually reflected from the subject.

2. The film is reversed. If it were being loaded correctly, the thumb of the right hand would cover the identifying notches. The rule: Hold film with notches at right-hand end of top edge. The light-sensitive coating then faces you. Shooting through film to the emulsion gives fuzzy results.

3. The negative isn't properly masked. Note the raw light spilling around the edges of the image. Stray light in the enlarger isn't fatal but does tend to gray highlights.

4. You can't flash a TV image. Video pictures are patterns traced in light; they will just be washed away by the over-all light of the flash bulb. Shooting this way is like beaming a light at a shadow to photograph it. Since he'll only get a blank screen it won't matter, but the angle is too high, also.

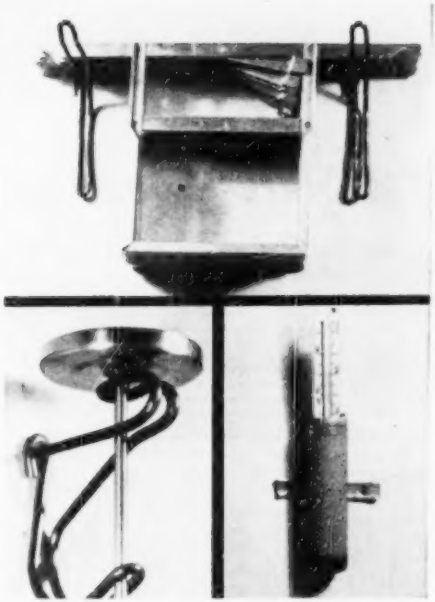
5. Box cameras are generally fixed-focused from about 6' to infinity. This close to the camera, the subject will be out of focus.

Camera Shows Depth of Field

WITH the new 35-mm. Kodak Pony 135 camera, you can tell the range in which all objects in your picture will be in focus. Used with the focusing scale, figures on the shutter plate show the depth of field at all distances and lens openings. Shutter speed, lens opening, and distance figures are visible as you look down at the camera. Film stop and exposure counter are automatic. Like the Pony 828, the 135 has an f/4.5 lens and speeds up to 1/200 sec. Priced at about $35, it takes 20- or 36-shot magazines, and has built-in flash synchronization.

Sound for Home Movies

MOVIES and sound are automatically synchronized on 16-mm. sound film by the new Auricon Cine-Voice Camera above. Designed for the home movie maker, it records sound along one edge of the film. The camera takes 100-foot film spools. The $700 outfit includes a microphone, amplifier, headphones, batteries, camera accessories, and fitted case. Lenses are extra. The outfit weighs about 34 pounds; camera alone, 12½.



Store Accessories Out of Way

COAT hooks can be used in the photo darkroom for storing various accessories while not in use. Above are two examples. At top, film hangers are simply laid across two hooks screwed in the wall. At lower left, the top prong of the hook was bent up and back to provide a secure seat for a dial-type thermometer.

At lower right, the cap from an old fountain pen serves as a safe receptacle for another type of photo thermometer.

Caster Ferrotypes Print Edge

THE edges of a ferrotyped print sometimes fail to take a gloss because of poor contact with the plate. To avoid this, go around the edges with a small rubber-roller caster after the print has been squeegeed.—*John J. Rea, Urbana, Ill.*

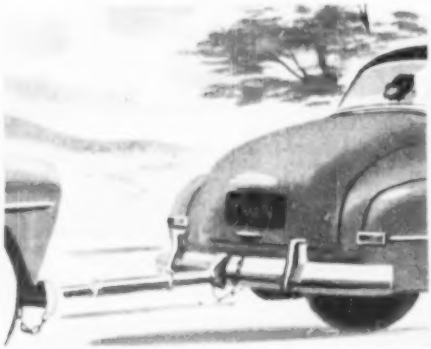
I'd like to see them make . . .

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

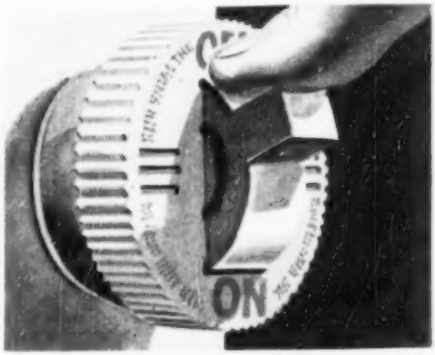
Left-hand threads on bottles of poison. Such threads, plus spikes on the cap, would warn you if you accidentally picked a poison bottle from a medicine chest in the dark, or when you're sleep-groggy.—*John Boniella, Perryopolis, Pa.*

Clean-out plugs for the sewer pipe that have a removable center section to take a garden hose. When the drain was stopped up, you could insert the hose for forced flushing.—*Mrs. Warren Bennett, Findlay, Ohio.*

Foot-treadle casters on electric refrigerators. By lowering the wheels, the refrigerator could be rolled away from the wall so the space behind and under it could be cleaned.—*John S. Saviello, Arlington, N. J.*



Hydraulic tow bars. These would be better than a towline since they'd take up the shock of starting when you towed another car. They should be small enough to fit the luggage compartment.—*Theodore Huddle, Deadwood, S. D.*

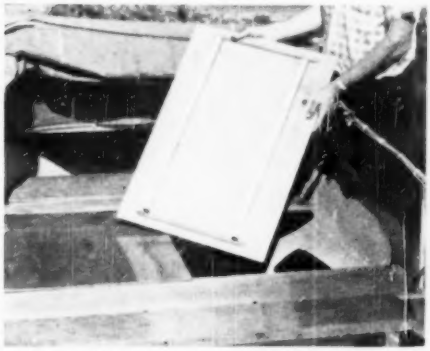


Circuit-breaker plugs. These plugs could be screwed into an ordinary home fuse box. Then when a short broke the circuit, you could just flip the lever to "on" instead of replacing a fuse.—*Bill Hall, Eugene, Ore.*

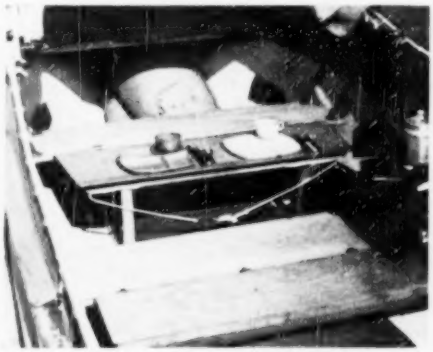
Folding Bed Built in Open Boat

YOU can make overnight trips in your outboard runabout when it's fitted with a folding bed like this one. Four pieces of ¾" plywood make the bed for almost any 12' to 16' boat. All pieces are backed by 1½" hardwood framing for strength and to prevent the pieces from slipping off the seats. Headrest, attached to back of front seat with loose-pin hinges, also doubles as seat back. Pins can be pulled and headrest placed in position on the front of the seat. —*Clinton R. Hull, Costa Mesa, Calif.*

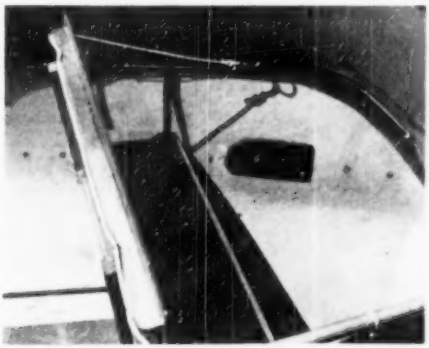
Sleeping pad, sheets, and blankets make comfortable bed. On this runabout the canvas shelter is folded forward for this photo.



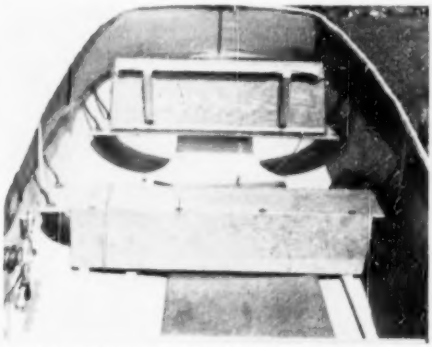
Hardwood ribs keep plywood sections from slipping off seats. Center sections, shown here, overlap front and rear seats by 1".



Legs hinged to top ribs of head and footrest convert them to tables for cooking and eating aboard. Bed roll is stowed forward.

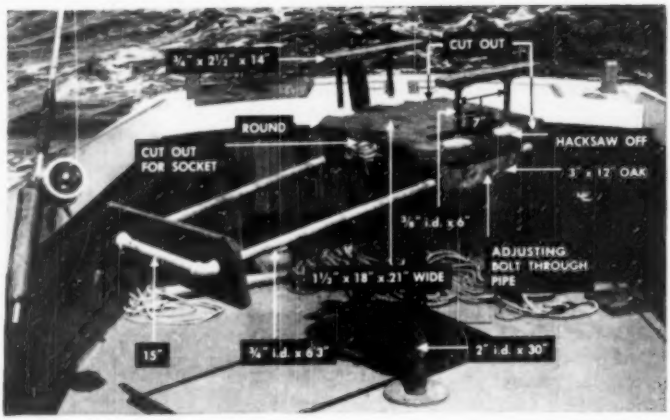


Headrest is also back of front seat. Rope holds seat back up. Block on side of boat is one of pair that support headrest when bed is made up.



Looking forward. Headrest is in position as a seat back. Hinged legs of footrest have been folded, allowing footrest to drop out of way.

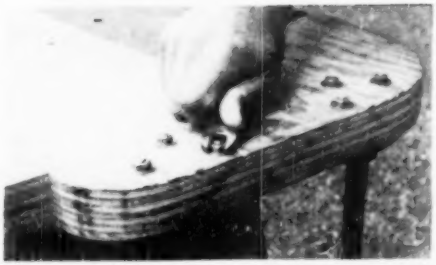
Details of chair are shown at right. Chair pivots on 2" pipe that is screwed into plate, 8" in diameter, bolted to the deck.



Fishing chair in use at left. Chair can be lifted off pedestal and pedestal unscrewed from deck plate for storage, leaving cockpit clear.

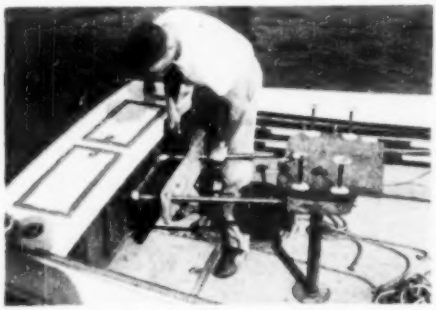
Build Your Own Fishing Chair

COST of a fighting chair for battling big-game fish can run into hundreds of dollars—if you buy it ready-made. Frank J. Mather, sports fisherman of Woods Hole, Mass., built the one pictured here for about $25. Only part he didn't build is the rod-socket assembly. Two pieces of ¾" waterproof plywood make up the seat. The foot-rest is adjustable by changing the adjusting bolts to various holes in the ¾" galvanized pipe.—*Elon Jessup, Woods Hole, Mass.*

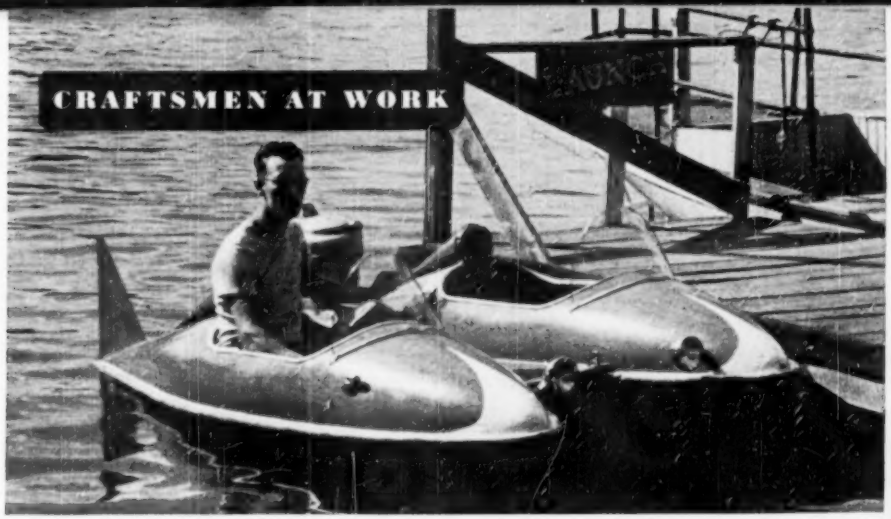


Bottom of seat is pictured above to show nuts that hold arm-support flanges, which are mounted overhanging seat edges.

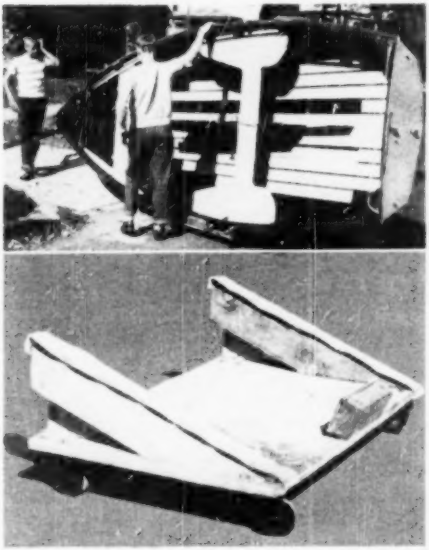
Arms being installed at right. Screwheaded ¼" brass bolts are used through the arms and flanges. Nuts and flanges are underneath arms.



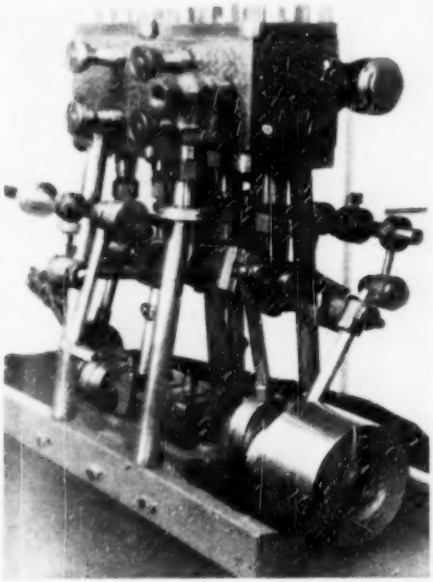
Details of under-seat assembly, left. Brass backing plate 7½" by 9" is screwed down. Flange is bolted down and 6" length of pipe brazed to it. Top of 30" pedestal nests snugly in the 6" pipe so seat will pivot. Photo at right shows foot-brace installation of galvanized pipe.



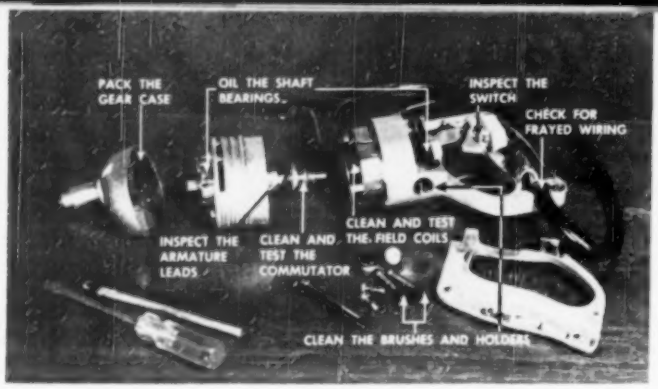
Siamese Twin Outboard. Two Akron, Ohio, men—Norman Lucky and Marvin Haas—converted a pair of droppable airplane fuel tanks to build this novel outboard runabout. After the tanks were cut open and seats and upholstery installed, they were joined by a narrow deck that supports a 7½-hp. motor at the stern. Top speed is about 20 m.p.h. Cost of building the boat, exclusive of motor, was less than $75.



Dolly Stores Boat on Side. To save storage space and facilitate handling of his boat in his workshop-garage, Tom Severs, of Moline, Ill., built this side-mount boat dolly. He used scrap lumber, four large casters, and discarded fire hose for padding. In building this type of dolly, care must be taken so the boat's center of gravity rests on the dolly's center. Otherwise, the boat would tend to topple off the dolly.



Engine Built with No Castings. This reversing, compound, marine steam engine, built by T. De Rosa, of South Vineland, N. J., measures 11" high and 12" long. No castings were used in its construction. It was built up of flat stock and rod stock and decorated with spot finishing. The engine has blow-off valves.



Most drills look like this when you get them apart, though the job of taking them apart will vary from one model to the next. Universal motors of this type are also generally used in vacuum cleaners, so new brushes and other replacement parts can often be found in vacuum-cleaner shops.

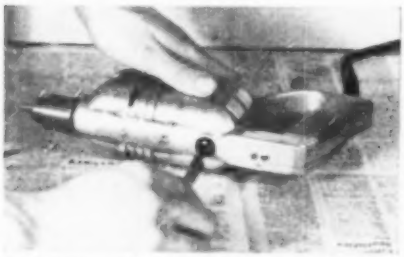
How to Pep Up a Drill Motor

By J. W. Rocke

ELECTRIC drills usually give a lot more service than they get. If your drill has lost its pep, it may be that the motor is pulling its weight in dirt or running on dry bearings. If so, you can put it back in top condition with a brush and an oilcan.

Or the trouble may run deeper. Defective armature and field coils can make a drill sluggish and unsafe to use. Coil rewinding is a tricky job, best left to specialists, but knowing when the job has to be done may minimize the damage and keep other parts from burning out.

What's wrong with *your* drill? These photos show what to check and how. The parts illustrated are standard for most drills.



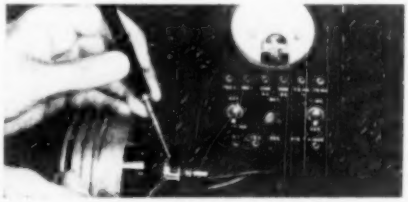
1

Remove motor brushes first. Unscrew the caps and lift the springs and brushes from their holders. Often you need go no farther to find trouble. Carbon brushes that are dirty, chipped, or excessively worn will cause arcing and loss of speed. They should be replaced.

To seat a new brush properly, wrap a strip of fine sandpaper (not emery cloth) around the commutator, grit side out. Fit the brush into its holder and rotate the armature by hand till the brush tip is shaped to match the curve of the commutator.

2

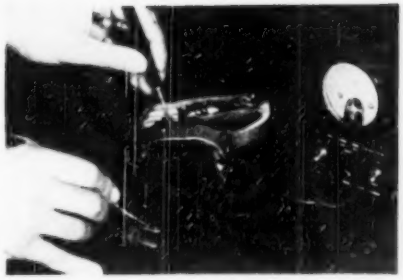
Clean the commutator and examine it for signs of roughness. Scored segments may cut down running speed. If the commutator looks okay, polish it with fine sandpaper. If it is out of round or badly pitted it will have to be trued up in a lathe. Mica separators will then have to be undercut—trimmed back so they lie below the copper bars.



3

An ohmmeter will tell you whether the armature needs rewinding. Use it as shown above to measure resistance between any commutator segment and the one next to it. Then measure from the second segment to the third, from third to fourth, and so on around the circle. The meter reading should be uniform from pair to pair. If a reading is too low, a coil may be shorted; if too high, the winding may be open. Either defect can rob the motor of power.

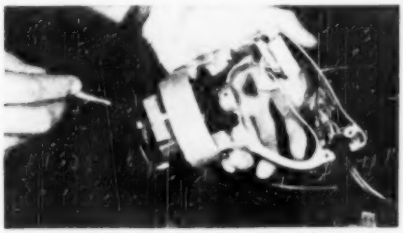
If the winding is grounded to the armature shaft, your drill is a shock hazard. To check this, touch one test prod to the shaft and the other to each commutator segment. If you get any reading, have the armature rewound. If you don't have an ohmmeter, make this test with a continuity checker. You can improvise one by wiring a bulb and a pair of test prods in series with the 115-volt line.



4

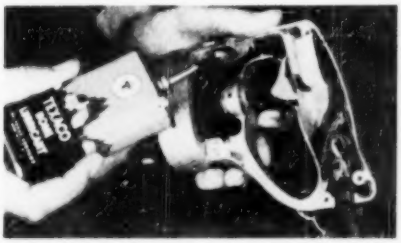
For safety, also test continuity between each side of the power cord and the case. There should be absolutely none. A "hot" drill handle conceivably could kill you. Examine the wires particularly at the point where they enter the handle. If they look frayed, cut away the damaged part or replace the whole cord.

Trace the wires that leave the field coils; one usually goes to a brush holder, the other to the power cord. Test between these points and the frame to make sure there are no grounds.



5

Visual checks can also give a lot of information, but to see properly you must first get rid of dust and grime. Brush and blow off as much dirt as possible, and clean the bearings, shafts, commutator, brushes, and coils with carbon tetrachloride. Examine all parts carefully for signs of scoring, pitting, excessive wear, burnt insulation, and the like.

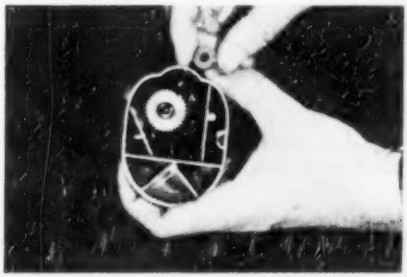


6

Lubricate the bearings. A drop or two of light machine oil will help keep your drill running smoothly. Oil holes are often placed inside the castings so proper lubrication is only possible while the drill is disassembled. Don't use too much oil, for the excess may work onto the commutator and foul the brushes. If there are no oil holes the drill probably has sealed bearings that need no lubrication.

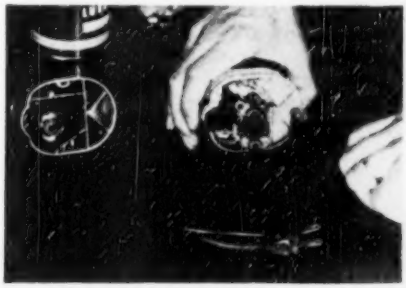
7

The gearbox can be lubricated with a mixture of graphite and light grease. Never pack the box solidly, for too much lubricant can create a power-robbing motor drag. Excess grease will also tend to leak out. Take careful note of the gear positions before removing them to pack the gearbox.



8

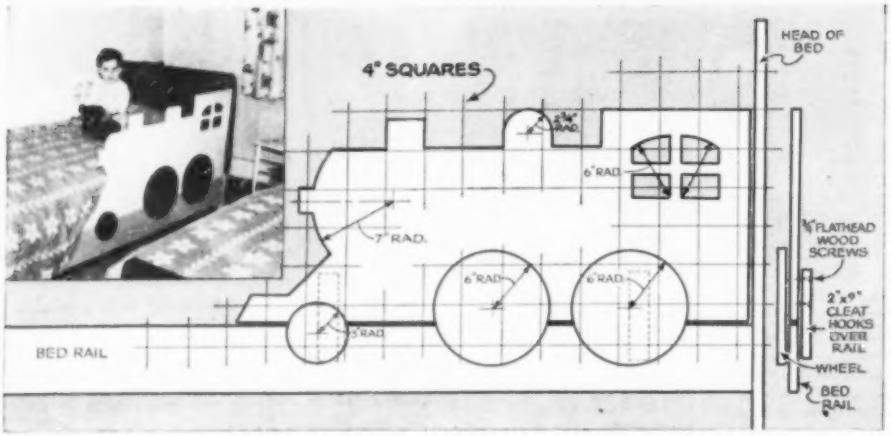
Thrust washers are used in most gear housings to prevent end-play between the gears. Worn washers will make the gears noisy. Chipped or broken gear teeth may cause premature wear of the gear train. Faulty parts should be replaced.



9

Reassemble the drill carefully. It should never be necessary to force any part into place. Tighten all screws evenly. Those shown join the two halves of the motor housing; if they are drawn up unequally, they may cause misalignment that will tend to bind the armature and gear shafts.

As a final precaution, repeat the continuity test by putting one prod across both prongs of the power plug and touching the other prod to the case. If you get any reading, the drill is unsafe. END



All Aboard for Slumberland!

With a sheet of ½" plywood and a jigsaw, you can make it fun for Junior to go to bed—as well as keep him from rolling out during the night.

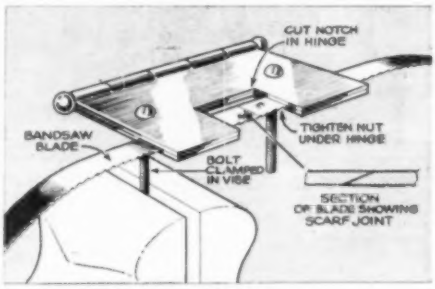
Cut out the locomotive silhouette and butt the bottom edge on top of the bed rail. After sawing out and painting the wheels, tack them in place so they overlap the rail. A clamping cleat also goes on the back. This makes it easy to remove the locomotive when Junior outgrows it.

With this side on his bed, a child can graduate directly from a crib to a full-size bed—*Robert V. Stewart, Cleveland, Ohio.*

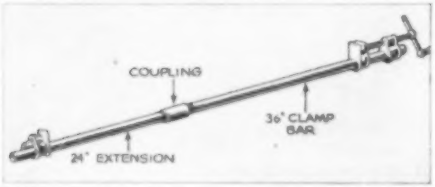
Hard-Soldering Broken Saw

Repairing a broken bandsaw blade will save you money. I do the job with a special clamp, made by cutting a notch ½" deep and 1" wide in a closed butt hinge.

File the broken ends of the blade as shown. Clamp them close together in the hinge and grip one of the two clamping bolts in a vise. Put a little flux and a dab of silver solder on the joint and turn your torch on it.—*W. V. Carter, Washington, D.C.*



Pipe Extends Reach of Clamp



When I set out to glue up a panel 55" wide, I found that the only available cabinet clamp had a maximum reach of 33". To extend it, I coupled a 24" piece of ½" pipe to the 36" length on which the clamp jaws were originally mounted. That did it. The removable extension makes the clamp easy to store.—*Wally Farnsworth, Los Angeles.*

Car Louvers Ventilate Wall

Louvered hoods from old-model cars in a junk yard can be used to make wall ventilators. The louvers below came from an old Nash.

With a solvent, clean the grease and dirt from the metal. Cut a piece of the louvered part of the hood to the size desired for the ventilator. Mount it with small screws to the back of a mitered frame of 1" by 3" baseboard stock. Paint the frame and ventilator to match the wall and nail in place over the wall opening.

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C. Kodak Eye-Level Tripod—"Steady does it" for still or movie camera. Quarter turn locks legs at any height from 2 to 5 feet. $23.33. And *Kodak Turn-Tilt Tripod Head* allows effortless panning with multiple-disk, felt-friction clutches. $15.46.

D. Kodak Service Range Finder—Good-by to guesswork in focusing. Just look through eyepiece, adjust knob until split image becomes single unit. Read scale for focusing distance. Split-field-type finder permits close adjustment even in poor light. With case, $14.58.

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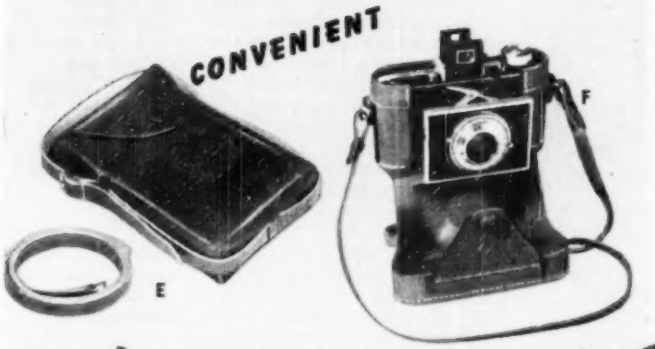
F. Kodak Field Cases—You "wear" your camera 'round your neck for instant use without removal from the case. Illustration shows field case on Kodak Flash Bantam f/4.5 Camera. Prices of field cases start at $2.50.



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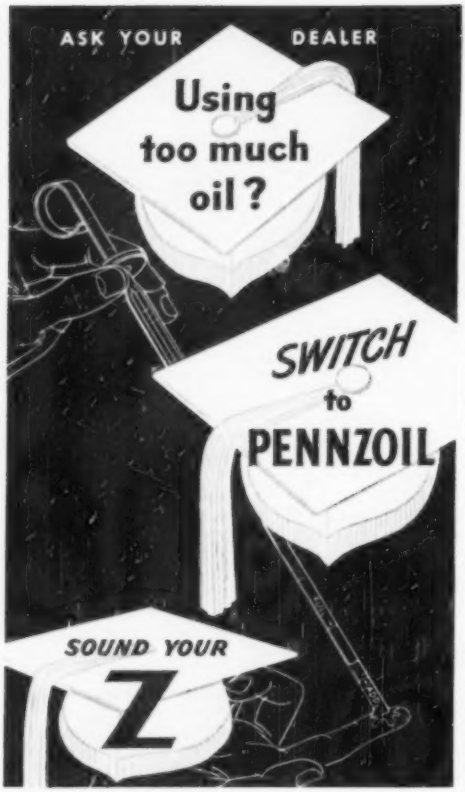

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Mechanics of Farming

By Ladd Haystead

■ Tractors powered with butane are sweeping the southern part of the nation. Neither the oil companies nor the farm-equipment people are promoting the change, but farmers are making their own conversions for economy. As one Mississippi planter put it to this reporter, 'I save the labor cost per day of the driver by switching to butane.' Besides cutting fuel bills, operators say, the tractors require less maintenance, partly because there is no dilution of lubricating oil by liquid fuel (On butane-fueled trucks, cylinder walls show no wear even after 300,000 miles of operation.) However, the change is limited to areas close to the source of supply, because the cost of shipping butane cylinders long distances eats up the saving in operating costs.

■ Airplanes seeded as much as 50,000 acres of pasture land apiece in a Government-sponsored project last year in the West. The planes drop pellets that contain, besides the seed, fertilizer, rodent repellants, and a growth starter. This year extensive areas of reforestation as well as range land will get the airplane treatment.

■ The Atomic Energy Commission announces that 'farmers cannot expect increased yields from money invested in radioactive materials.' But at the same time, the AEC emphasizes that radioisotopes have made a great contribution to the understanding of how fertilizers react on plants. Sixteen agricultural experiment stations have obtained valuable results in the last year in radioactive phosphorous 'tracer' research.

■ On the mineral-rich lands of the West, bumper crops could be produced if only there was water. In the past, this meant heavy Government expenditure for enormous dams. But recently, fresh interest has been generated in underground rivers and lakes, such as one now being devel-

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Too long, Mister, it's engine-wrecking stuff—and if you want to duck some unpleasant repair bills...you need a new Purolator Refill for your oil filter—quick!

If you've been neglecting to have your oil filter checked, chances are there's horrible muck like this in your car. So when you change your oil this summer, start fresh with a *new filter refill*.

Be sure you get a Purolator Refill. Filters more *completely*, hence saves more substantially on repair bills. Costs only $1.38 to $3.00, depending on make of car. Inserted in a few minutes.

P. S. If your car has no oil filter, a *complete* Purolator, *both* housing *and* refill, costs only $6.50 or a bit more, depending on make of car. Purolator Products, Inc., Rahway, N. J. and Toronto, Ontario, Canada.

Purolator

MICRONIC* OIL FILTER

*Reg. U. S. Pat. Off.

oped in the Estancia Valley of New Mexico. Here, there is no visible running water, but a young sheepman named Walter Mayer gambled there was a lake under the valley. He prospected for water--not oil--and hit. Now wells 60 to 300 feet deep provide 2,000 gallons per minute each--sufficient to irrigate 150 acres. The land, once worth only a few dollars an acre for grazing, is producing fabulous crops of as much as 4 tons of alfalfa per acre (usual average is ¾ ton), and the land is being quoted at $200 per acre. It is possible that lands in the more humid climates may also be sitting on lakes. If so, the droughts that have cut farm income may be offset by drilled wells to provide stand-by watering in dry years.

■ Ties and poles discarded by the railroads each year amount to 3,000,000 tons of raw wood pulp, according to Dr. William M. Murray, Jr., director of Southern Research Institute, Birmingham, Ala. This equals one-seventh of the total annual needs of the country's paper industry. Paper bags and wrapping paper made from the discarded material are somewhat weaker than those made from new wood, but further research may raise the strength to the level of new-wood paper. Dr. Murray also suggests that sericea lespedeza, the widely popular forage plant of the South, may provide a source of pulp from the woody stalks left after the livestock feed is harvested. Experimental runs have already proved them useful in paper manufacture.

■ Paper towels for cows is the newest wrinkle in bovine sanitation, says Cornell University. Instead of washing and cleaning a cow's udder with a cloth towel, which might carry infection from one cow to another, paper towels are used and then thrown away. The claim that this method will materially reduce the $600,000,000 yearly loss from mastitis is greeted with some reserve by veterinarians, who point out that mastitis seems to be caused by traumatic injury, cold stalls, etc., as well as by transference of infection.

"I Joined the Air Force to build a Career"

The new Airman Career Program develops skills for lifetime careers.

Airmen enjoy ample free time for sports and recreation, 30 days annual vacation with pay.

An Airman is a *career* man, with opportunities for advancement, security and success.

Where else can you find such opportunities as you're offered in the new Airman Career Program!

As an Airman you're on your way to a real career. Scientific aptitude tests reveal your strongest abilities. Then you are expertly trained, either on the job or in the world's finest technical schools, for one of the 400 job specialties in the many Airmen career fields—with full pay from the start. You have many opportunities for education, advancement, security, and the good things of life. Inquire about the Airman Career Program at your nearest Recruiting Station.

U. S. AIR FORCE

RECRUITING U.S. ARMY U.S. AIR FORCE

Visit Your U. S. Army and U. S. Air Force Recruiting Station

WHY WASTE TIME

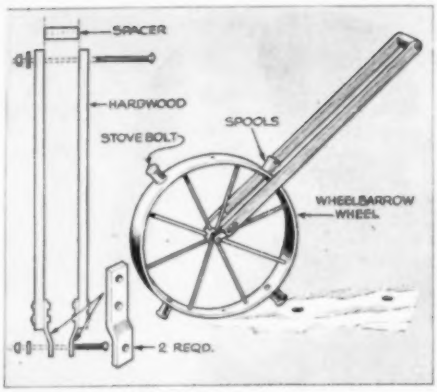
with "temporary polishes?"

Newer cars need only Simoniz to clean and beautify the finish... a single, simple operation. On older cars, first use Simoniz Kleener (Liquid or Paste) to clean the finish. Then Simoniz for lasting beauty.

SIMONIZ GIVES TWICE THE SHINE AND IT LASTS!

Long lasting Simoniz saves time and effort...really protects and preserves the finish...keeps colors from fading! Your car will stay brighter than new with Simonizing—the Deluxe Beauty Treatment.

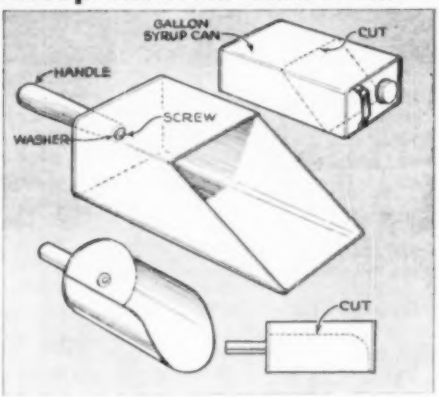
THE SIMONIZ COMPANY, CHICAGO 16, ILL.



Old Wheel Spaces Plants

THE wheel from an old wheelbarrow and odds and ends of scrap will make a plant spacer for your garden. Drill holes in the wheel at about 6" intervals. Then you can adjust the spools for various intervals between plants.—*V. H. Lamoy, Upper Jay, N.Y.*

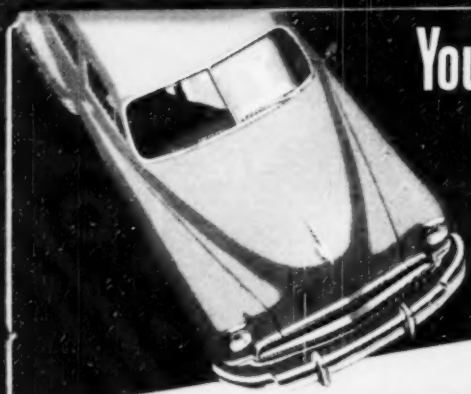
Scoop Cut from Gallon Can



FARMERS and storekeepers will find this scoop handy for grain, flour, and feed. Cut a gallon syrup can as shown and put a wood handle on it. A washer keeps the screw head from pulling through the metal. A round can may also be used.

Aluminum Keeps a Cool Head

IF YOU have to be out for a long time in the hot sun, you can protect your head from some of the effects of the rays by lining your hat with aluminum foil. Slip the edges of the foil under the sweatband to prevent actual contact with hair or skin.—*P. A. Dalal, Bombay, India.*



You're driving into the Danger Zone

WARNING ZONE
Engine loses pep . . .

Needs a tune-up

Clean, adjust and re-time ignition. Clean fuel supply and carburetor screens. Adjust carburetor. Adjust tappets and fan belt. Check compression and vacuum readings for symptoms of ring wear.

DANGER ZONE 1
Engine begins to smoke . . .

Needs new piston rings and minor engine repairs

Replace piston rings. Align rods. Adjust rods or replace rod bearings. Reseat and reface valves.

Tune engine.

These repairs are comparatively inexpensive and put the engine back in peak condition for thousands of economical miles. Delay puts the engine in Danger Zone 2.

DANGER ZONE 2
Engine pumps oil badly . . .

Needs new piston rings and major engine repairs

Replace piston rings. Replace piston pins. Adjust—probably replace—main bearings. Align rods. Adjust rods or replace rod bearings. Reseat and reface valves. Tune engine.

These repairs naturally cost more than those needed in Danger Zone 1, but they put the engine back in condition for thousands of additional miles of satisfactory service. Delay leads to costly Danger Zone 3.

DANGER ZONE 3
Destructive wear sets in . . .

Needs new piston rings and complete overhaul

Repairs cost three or four times as much as in Danger Zone 1.

Remove engine. Remove cylinders. Replace pistons, pins, rings. Replace main bearings. Align rods. Refit or replace rods, or replace rod bearings. Overhaul valve lifters, rocker arms. Replace timing chain or gears. Reseat, reface valves. Replace guides and springs. Replace camshaft bearings. Clean oil lines. Overhaul oil pump.

Clean, re-install and tune engine.

The more you delay - the more you pay!

Piston rings should be replaced . . . *at the first sign of wear!*

You'll be money ahead if you replace your piston rings when your car first gets into the Danger Zone. But if you delay until the second or third Danger Zone, repairs cost two to four times as much.

In *any* Danger Zone, ask your motor service man for Hastings Piston Rings. They *stop* oil-pumping, *check* cylinder wear and *restore* performance.

It's the best money you can spend on your car.

HASTINGS MANUFACTURING COMPANY • HASTINGS, MICH.
Hastings Ltd., Toronto

HASTINGS STEEL-VENT PISTON RINGS

Vacuum-Grip Bulb Changer

CHANGING ceiling electric-light bulbs is a simple task with this device that clasps the bulb in a vacuum-operated rubber holder. A single stroke of the pull-out rod at the handle end, as shown at left, works a built-in vacuum pump. Since no pressure is exerted against the bulb as in mechanical grippers, it is claimed that breakage is eliminated. Made by the Lumidor Mfg. Co., of Los Angeles, the gadget will handle all bulbs from 15 to 1,500 watts.

Small Fry Thirst Quencher

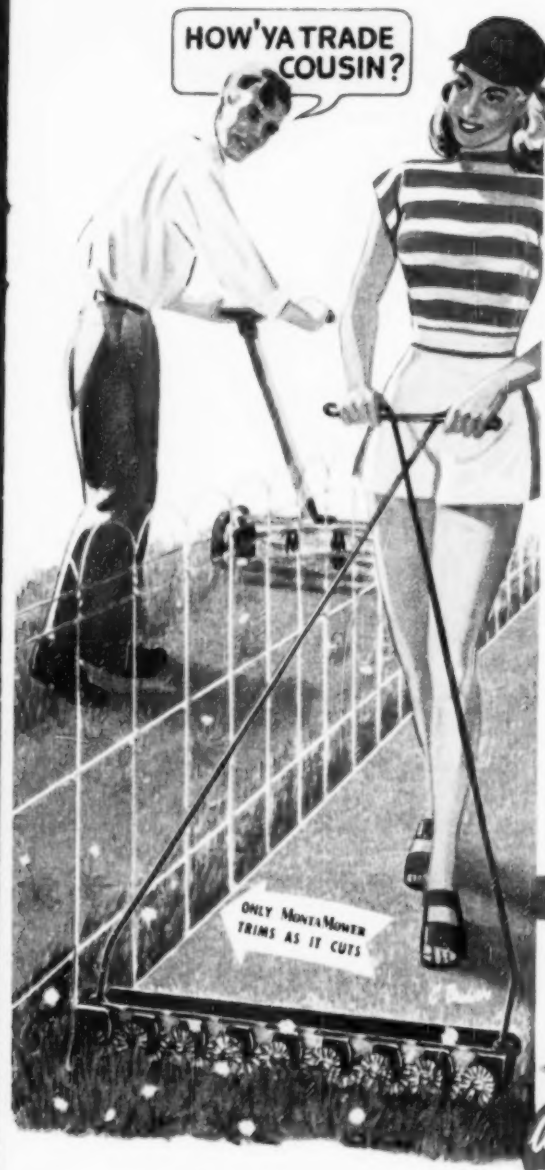
NO NEED to boost Junior Miss or her kid brother to reach this "small fry" drinking fountain made by Westinghouse. Mounted halfway down the side of a standard water cooler, the child's bubbler may be finger operated at the same time mother is having her fill at the upstairs fountain.

Machine Vends Fresh Fruit

A COIN dropped into the slot of the Fruit-O-Matic, shown being loaded above, brings you a choice of four kinds of fruit chilled to perfect eating temperature. The refrigerated vendor has a capacity of 208 pieces of fruit held in small steel wire baskets that rotate on endless metal bands. The machine is made by the Fruit-O-Matic Manufacturing Co., of Los Angeles, Calif.

Sandbox Is Also Wading Pool

MADE from a single sheet of heavy gauge steel, this sandbox is strong enough to support several children. The playbox measures 40 by 45 inches, and can be assembled in a few minutes without tools. Filled with water, it doubles as a wading pool. Sturdy one-inch plank seats fit along two sides. Made by the American Metal Specialties Corp., of Hatboro, Pa., the Sand-E-Wade comes with a colored vinyl-fabric canopy.



MONTAMOWER
Mows and Trims LAWNS
IN ONE EASY OPERATION

"I wouldn't trade my MontaMower for a dozen ordinary lawn mowers!"

The above statement is a direct quotation from one of thousands of unsolicited testimonial letters received from MontaMower owners every year.

And little wonder MontaMower owners are so enthusiastic! MontaMower represents the first basic advancement in lawn mowing devices during the past half century. It is a new and different kind of lawn mower that mows and trims in one easy operation.

Actually, the MontaMower is a live, 8¼ lb. precision machine that smoothly and quietly cuts a full 16" swath through grass, dandelions, spike grass and tall lawn weeds (including the ones that ordinarily pop back up to cause you extra work).

AND WHAT'S MORE – MontaMower does what no conventional mower can do! It cuts right up to walls, fences, trees and posts – practically eliminates hand trimming. It cuts under foliage, around flower gardens and close-quarter borders which cannot be mowed successfully with conventional hand or power mowers.

The MontaMower is so light, so sturdy and responsive, that even women and children can operate it easily and efficiently. Owners tell us that with their new MontaMowers they cut their lawns in half the time – with less than half the effort.

Learn these facts about the MontaMower from actual experience . . . it's sold under a liberal "Written Guarantee" which permits you to try it on your own lawn . . . makes you the sole judge of its merits. Get the complete facts about the moderately priced MontaMower, AT ONCE! **Just fill out the coupon below and mail it today.**

SAVE TIME AND LABOR WITH A MONTAMOWER

Weight only 8¼ lbs.

SOLD DIRECT — ON APPROVAL

Here's HOW IT WORKS

The new improved MontaMower has eight pairs of sharp-edged, precision made and fitted, tool-steel cutting disks, slightly overlapping and self-sharpening, working as a unit. Each pair revolving toward each other gathers the grass and cuts it cleanly at the intersection of the disks. The new improved model is easily and quickly adjustable to cutting height. It's as modern and efficient as an electric razor!

The MontaMower is sold only by direct mail to users (no agents or dealers . . . no foreign sales at present.)

TRY IT ON YOUR OWN LAWN!

MONTAMOWER DISTRIBUTING CO.
Sales and General Offices
PS-06 KEELER BUILDING • GRAND RAPIDS 2, MICHIGAN

Gentlemen: Without obligation, kindly send me complete descriptive literature, price, guarantee information, and full details of Approval Offer.

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FACTORIES, TRAVERSE CITY, MICHIGAN

MAIL THIS COUPON TODAY!

© 1950 BY RAY-O-VAC COMPANY, MADISON, WIS. RAY-O-VAC CANADA LTD., WINNIPEG, MAN.

See how much more you get

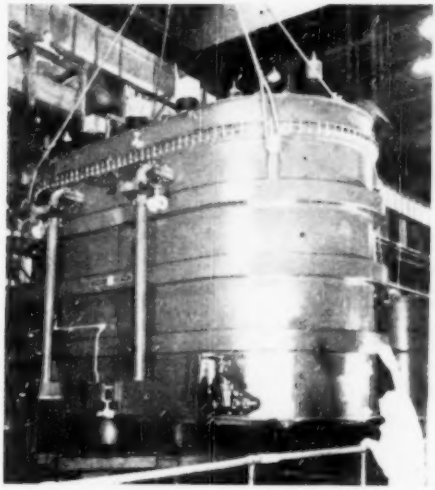
in these truly modern batteries. Each Ray-O-Vac Leak Proof starts with a powerful, well made battery. Then . . .

1. **Steel bottom is added.**
2. **And a steel top.**
3. **Next—multi-ply insulation.** Many layers of protection against corrosion.
4. **Last—a steel jacket.** This completes an air-tight seal, to stop corrosion and keep the battery fresh and powerful. Only Ray-O-Vac builds batteries with all four of these safeguards.

GUARANTEE on every Ray-O-Vac Leak Proof: "If your flashlight is damaged by corrosion, leakage or swelling of this battery, send it to us with the batteries and we will give you FREE a new, comparable flashlight with batteries."

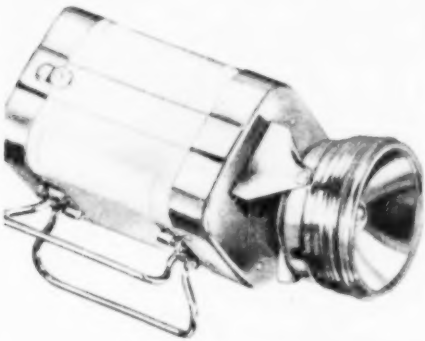
Ask for Ray-O-Vac Leak Proofs

Buy Spares ... *they stay fresh*



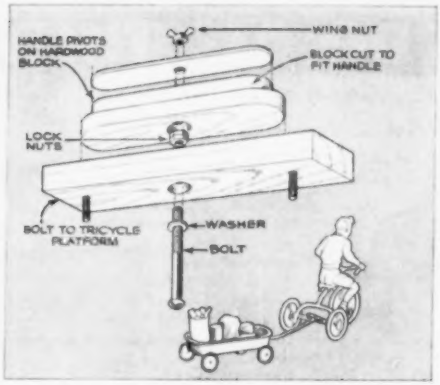
Transformer Takes Big Load

The 150-ton transformer shown above being lifted out of a General Electric test pit will handle enough electric power to supply a city of 150,000 people. Rated at 145 million watts, it raises 15,000 volts to the 135,000 volts needed to power Detroit Edison transmission lines. Big as it is, the huge transformer is 25 percent less bulky than previous models with this rating.



Flashlight Has Double Power

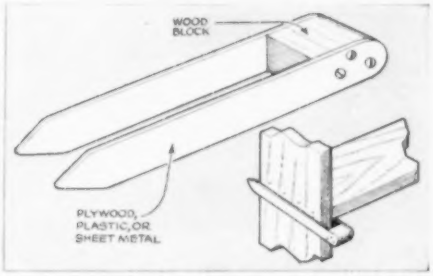
With eight standard flashlight batteries in its compact case, the Yellow-Flash light shown above claims twice the power of an ordinary camp or fishing lantern. Less than 8 inches long and only 3¼ inches square, the light fits easily in a glove compartment or tackle box. The Justrite Mfg. Co., of Chicago, makes it to sell for about $4.



Hitch a Wagon to a Tricycle

Your youngster will get a kick out of this simple trailer hitch with which he can tow a wagon behind his tricycle. For neat appearance and accurate control, it's miles ahead of a messy, tangled towrope.

Carve a hardwood block to fit the wagon handle and leave a supporting flange on the bottom. If it's easier, make the two steps separately and fasten the pieces together. The turning block is pivoted to a base as shown. If the platform of the tricycle is smooth and flat, the base can be omitted. The clamp plate, cut from ⅛" strap iron, swivels at right angles to the block to hold on the wagon handle. The wing nut clamps it fast.—*Charles H. Hardy, Los Angeles.*



Parallel Tool Guides Assembly

Here's a homemade tool that helps a lot in such assembly operations as locating screws or nails for bookshelves. Make the blades of any material that won't warp or bend out of shape. In attaching the blades to the wood divider, be careful to get them parallel and their edges even so you can transfer measurements around a board.—*Stinson Scram, Brantford, Ont.*

DO ALL THIS

...and more with the

Super-Value **CASCO**

Electr-o-matic

POWER TOOL-KIT

Super-speed, precision-engineered — the most practical power workshop you can own! Pays for itself a hundred times over when put to work on dollar-saving repair jobs throughout the home. Makes decorative objects, too! No home repair or hobby job too difficult. Complete with 50 accessories, lifetime plastic chest and 36-page project book.

At Department, Hardware, Jewelry and Appliance Stores.

55 PIECES ONLY $19.95

New! Glamorous!

ILLUMINATED

FENDER GUIDE

LUCITE! Smartly styled to beautify your car . . . to make driving and parking safer day and night! Rod glows faintly all the way to top. Soft light shines from tip for ease of seeing in the dark. Chrome mounting bracket allows adjustment on any fender and is easily attached.

$2.65

IF YOUR CAR-LIGHTER'S LOST OR BROKEN, REPLACE IT WITH THE ORIGINAL

CASCO

POP-OUT

CIGARETTE LIGHTER

ONLY $1.50

Replace your lost or broken car lighter with a new Chrome-plated "Pop-Out", best because it's original equipment in 9 out of 10 cars. Automatically pops out in 10 seconds with an even glow. Get Casco Accessories at Car Dealers, Auto Supply Stores, Service Stations.

CASCO CASCO PRODUCTS CORP. BRIDGEPORT 2, CONN.

NOW!

FILL CRACKS IN A JIFFY

EASY WAY to fill cracks and holes in wood, plaster and other materials. SAVOGRAN CRACK FILLER dries hard as stone. SAVOGRAN WOOD PUTTY contains real wood — is easily tooled. Both are quick-hardening, non-shrinking — take paint beautifully. Repair furniture, floors, woodwork, tile, knobs — 1001 uses! Big 1-lb. can ONLY 35¢ where you buy paints.

Write for Helpful Free Folder

SAVOGRAN

DEPT. 29, BOSTON 16, MASS.

CRACK FILLER WOOD PUTTY

Snap-on* **UNIVERSAL RETHREADING TOOL**

reclaims damaged threads

Rethreads bolts ½" to 5" dia., and pipe ¼" to 4" dia. Seven chasers to recut threads from 6 to 24 pitch are included.

$14.90 plus local sales tax

*Snap-on is the trademark of Snap-on Tools Corp.

SNAP-ON TOOLS CORPORATION
8060-F
28th Ave.
Kenosha,
Wisconsin

I enclose ☐ check ☐ money order or ☐ Company Purchase Order for the TR-20 Rethreading Tool.

Name.....

Address.....

City.....State.....

Drive *anywhere* this summer

AND NEVER HAVE A FLAT TIRE!

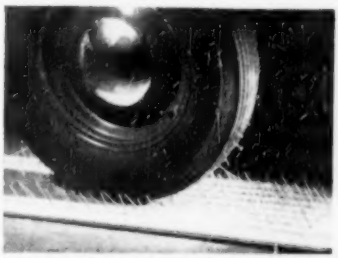
Fishing haunts back in the woods . . . picnic spots off the main road . . . unexpected puncture-full detours . . . and never worry for a second about having a flat tire!

Run right over razor-sharp glass! The punctures will be sealed as you ride, with Seiberling SEALED-AIR Tubes (completely different from any other tubes in the world!)

NO ONE CAN IMITATE THE WAY THIS TUBE SEALS PUNCTURES!

Exclusive design principle . . . perfected, proved, and patented by Seiberling . . . makes SEALED-AIR Tubes different from all others in the world . . . gives you *more protection* against troublesome flats and dangerous blowouts.

***Outlasts* set after set of tires.** Think of the savings! And you won't have to spend a nickel on tire repairs, either. If you drive a car or truck, mail the coupon below for complete details on this amazing tube . . . and what it can do for you.



Pick up nails . . . not just one nail, but a dozen or a hundred . . . and what happens? NOTHING, when Seiberling patented SEALED-AIR Tubes are inside your tires.

Mail the Coupon NOW!

SEIBERLING

***Sealed·Air* TUBES**

WITH PATENTED BULKHEADS

FREE True Story: "10,189 PUNCTURES, AND NOT ONE FLAT." Learn how the only tube built around patented Bulkheading principle can save you money . . . AND TROUBLE. No obligation. Simply mail this coupon now (before YOU have a flat!) to Seiberling Rubber Co., Dept. PS-3, Akron 9, Ohio.

Name _____

Address _____

City _____ State _____

FATHER'S DAY
JUNE 18

KING for a DAY!

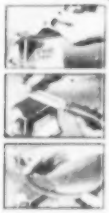
For the King!

SYNCRO *Electric* **HONE**
$12.50

with *STONES THAT MOVE 240 STROKES PER SECOND!*

Make Dad glad with this! SYNCRO is the only all-purpose electric hone with 240 strokes a SECOND. Hones sharp home and shop tools, knives—most anything else. Easy. Speedy Safe. Beautiful chrome finish.

WITH BUILT-IN MOTOR, 4 *stones—$12.50.*



SYNCRO Sander-Polisher-Massager

Dad will like this work-saving tool with exclusive Double Arc Motion. For light sanding, polishing, relaxing massaging! Just guide it. Comparison proves it best. Silvery chrome body and black bakelite top.

WITH BUILT-IN MOTOR, *10 sandpapers, lamb's wool, fabric polish pads, $14.50.*

$14.50

SAFE SYNCRO JIG SAW
For the Royal Family!

Ideal for Dad's workshop—safe for children! THOUSANDS used in schools, hospitals, homes. Saws any length 1/2" wood, thin metal, plastic. Portable. 14,000 safety strokes a minute.

WITH BUILT-IN MOTOR —*$17.50.*

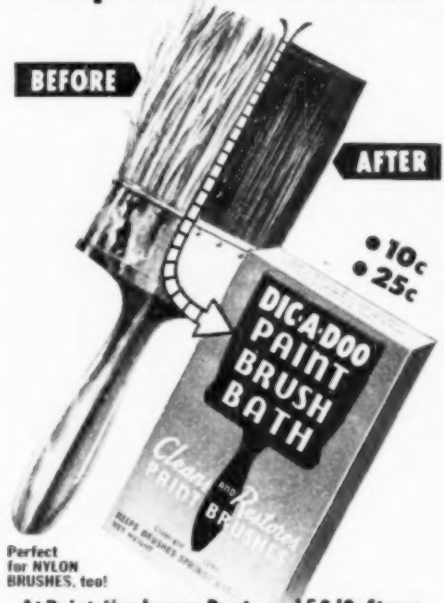
THAT'S the Name to Ask For!

SYNCRO
ELECTRIC TOOLS

Operate on 60 cycle, 110-120 volt, AC only. At best hardware stores. If none near you send article price, we'll ship POSTPAID promptly.

SYNCRO CORPORATION
Dept. G-68, Oxford, Michigan, U. S. A.

Keep Brushes like New



Perfect for NYLON BRUSHES, too!

At Paint, Hardware, Dept., and 5 & 10c Stores

Patent Cereals Co. Geneva, N. Y.

PROBLEM: Pipe union against wall. No space for pipe-wrench. How to turn it?

VISE-GRIP gets into close quarters . . . **LOCKS with Ton-Grip** . . . makes "impossible" jobs easy! Has 1001s of uses about the home, shop, factory. Only the genuine VISE-GRIP has **Involute Jaw Curve** that holds all shapes. **Knurled Jaw Tips** that hold to the very tip. **Thin Nose. Super Wire-Cutter.** With cutter: No. 7W, 7", $2.25. No. 10W, 10", $2.50; Without cutter: No. 7C, 7", $1.85, No. 10C, 10", $2.25. If not at your dealers, order direct.

PETERSEN MFG. CO., Dept. M-6, DeWitt, Nebr.

SHAW CAN MAKE IMMEDIATE DELIVERY

Easy and Cheap to Operate

SAVE TIME, WORK, MONEY!

SHAW "DU-ALL" and "PEPPY PAL" TRACTORS

PLOW

CULTIVATE

These rugged walking or riding tractors are ideal for farm, truck garden, orchard, poultry farm. Operate on a few cents an hour. A child can handle them.

DO DOZENS OF JOBS Both riding and walking tractors quickly and easily plow, cultivate harrow, disk, bulldoze, spray, haul, grind, saw wood, etc.

LOW FACTORY PRICES Buy direct or through your dealer. Year's guarantee!

RIDING TRACTORS 4 models from 5 to 12½ H. P., 58 in. wheelbase, 36 to 52 in. wide, 24 in. plant clearance. Hand or electric starter. Walking Tractors 1½ to 5 H. P.

FREE Illustrated folders giving complete details and price lists—write today!

SHAW MFG. CO. **5706 FRONT ST., GALESBURG, KANS.**
668 PS NORTH 4TH ST., COLUMBUS, O.

A MILLION DOLLAR SECRET !

There's a million-dollar secret behind the spectacular performance of the new AC Spark Plugs: It's *CORALOX*, AC's patented Insulator.

But there's no secret at all about the easier starting, surer firing and longer life of these new AC's with *CORALOX* Insulator.

Engineers know those facts—hence more new cars and trucks are equipped with AC's than with any other make.

More and more owners, too, are learning about these better AC's—and are buying them for improved service in their cars, trucks and tractors.

AC spent years of scientific research and development work in perfecting *CORALOX*, yet you can have its extra benefits at the price of ordinary spark plugs. Your AC Service Dealer has the new AC's now—to save you time, fuel and money.

AC SPARK PLUGS

AC SPARK PLUGS · AC OIL FILTERS · AC FUEL PUMPS

preferred on millions of vehicles

PATENTED CORALOX INSULATOR

AC SPARK PLUG DIVISION · GENERAL MOTORS CORPORATION

Screen chores are LIGHT

with LUMITE saran screening!

because it's . . .

RUSTPROOF Guaranteed never to rust, rot or mildew . . . unaffected by salt air or smoke, rain, snow or industrial fumes! It's the ideal screening for every exterior use.

STAINPROOF Lumite is guaranteed stainproof because it's rustproof. It never needs protective painting. It cleans easily.

LASTS AND LASTS Lumite offers long range economy . . . costs only 11½ to 12¢ a square foot . . . when adequately framed gives years of trouble-free screen protection! Sold by hardware, lumber, and building supply dealers.

LUMITE* SARAN SCREENING

*Registered Trade-mark

SEND FOR FREE SAMPLE TODAY

LUMITE DIVISION. PS-6
Chicopee Manufacturing Corp. of Ga.
40 Worth Street, New York 13, N. Y.
Please send me information and FREE sample of Lumite Screening.
Name.....
Address.....
City.....Zone.....State.....

NEW DUMORE GRINDER
Low Cost—Dual Purpose
Combines Lathe & Bench Grinding

FULL ¼HP

.0002" Accuracy . . . Full Shift Stamina

The versatile, new Dumore Utility Grinder converts your 9" - 13" lathe to a precision external grinding machine. Bench or wise mounted, it serves as bench grinder, polisher, wire brusher, or buffer. It's a natural for small machine shops and general shops as well as metal working hobbyists. It gets those occasional special grinding jobs as well as production jobs finished fast and at LOW COST!

Grind It In Your Own Shop—FASTER—CHEAPER

With Utility Grinder garages, repair-shops, fleet operators and maintenance shops can now do fast and low-cost valve grinding, resizing after metalizing, welding clean-up and similar operations requiring precision grinding as well as the every day production jobs. Write for literature to:

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PS-3 **RACINE, WISCONSIN**

Now ALL SHOPS CAN AFFORD PRECISION GRINDING!

ENJOYABLE WOODWORKING PROJECTS!

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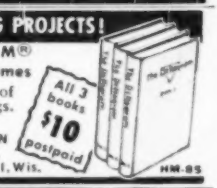

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WHY BREAK YOUR BACK MOWING FIELD OR LAWN?

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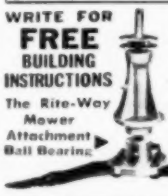

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Now anyone can save time and effort mowing field or lawn by building their own whirl type power mower. Build according to your own ideas and needs at small cost. Cut close to fences, walks, buildings, etc. Build in short time with parts and instructions we furnish. Save hours of time and back breaking labor. Write today for FREE information.

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"The Little Marvel" All-Metal welder. 5-year written guarantee. Welds ⅛ thick metal or money back. Repairs tanks, tools, fenders, machine parts, etc. Comes complete with everything — rods, unit, eye shield, and directions. We also make a welder for 16 to 22 gauge metal . . . $3.95 complete. On C.O.D., postage extra.

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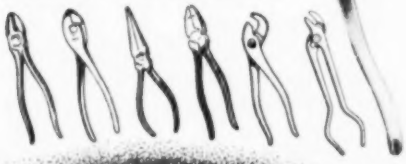

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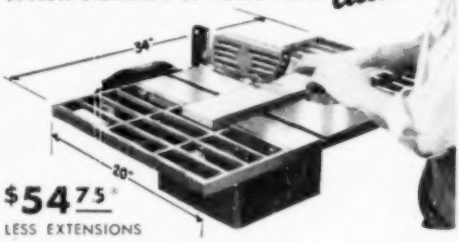

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MAKES LAWN MOWING FUN

Equip your hand mower with a LeJay MidgeTractor. It snaps on in a jiffy. It's ready to go! Backs up and maneuvers amazingly easy. Costs far less than regular power mowers. Unheard of low price—Only $34.95 complete. Or, $27.70 less engine . . . use your own engine (any make 3½-11½ HP or ¼ HP electric motor). Free literature. Guaranteed with money back 5-day trial offer. Order your LEJAY MidgeTractor from this ad, do it today. (Sold by mail order only.)

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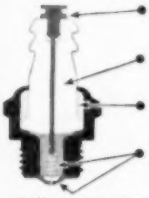
CHAMPION V-GLOW PLUGS
for model engines only



- **CHAMPION TERMINAL**—assures better center electrode seal and provides sturdier electrical connection.
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- **CHAMPION SILLMENT SEAL**—prevents excessive compression leakage between insulator and shell.
- **CHAMPION "THERM-O-FLEX" CONSTRUCTION**—longer element life, more dependable performance.

Follow recommendations of plug types and fuels approved by engine manufacturer.

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BE A CHAMPION DRIVER

LEARN THE "SIGN LANGUAGE" OF THE HIGHWAY!

1. The meaning of a highway sign is generally indicated by its shape. The octagonal sign means STOP.

2. A round sign indicates a RAILROAD CROSSING and warns you to approach it with caution.

3. A diamond shaped sign tells you to SLOW DOWN—indicating a dangerous curve, hill, or similar hazard.

4. A square sign normally indicates SCHOOL ZONE or other areas involving hazards to pedestrians.

5. A rectangular sign gives TRAFFIC DIRECTIONS—Keep To Right, No Left Turn, No Parking, etc.

On a dark, rainy night like this, the shape of the sign ahead tells this driver that a railroad crossing lies ahead. It alerts him in time and warns him to approach it with caution.

Because children are inclined to be heedless, drivers should be particularly watchful for signs indicating school zones. Caution and courtesy distinguish the Champion driver.

A Champion driver is attentive to little things that pay big dividends in the pleasure, security, economy and dependability that you derive from your car. Spark plugs contribute largely to these dividends. Check them at regular intervals and replace them every 10,000 miles. They quickly pay for themselves. The great majority of champion drivers prefer and use Champions—the spark plugs champions use.

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FOLLOW THE EXPERTS—

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"I used the same identical set of Champion Spark Plugs in winning four major speedboat events last year, including the international Harmsworth race."
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CHAMPION
SPARK PLUGS

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Listen to the CHAMPION ROLL CALL . . . Harry Wismer's fast sportscast every Friday night, over the ABC network

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SAVE UP TO $50 OR MORE

EXCLUSIVE GIL-BILT BUILD-IT-YOURSELF FEATURES

- Engineered for home construction by world's leading manufacturer of build-it-yourself power tools.
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- No guess work. No blueprint reading. Step-by-step pictorial plans, full size patterns, actual photographs.
- Sturdy wood & plywood construction, engineered for reduced noise and vibration.

GIL-BILT 36 INCH ATTIC FAN

- Molded rubber cushions minimize vibration.
- Soundproofed ball bearings, sealed against dust and dirt.
- Efficient 36 in. Torrington Steel Blade.
- Horizontal mounting makes installation easier.
- Rubber cushioned mounting brackets reduce noise.
- 9000 C.F.M. with 1/3 h.p. motor. Cools entire house.

GIL-BILT KIT #510-A Includes Plans, bearing blocks, 3/4 inch steel shaft, Torrington blade, two V-pulleys, V-belt, rubber cushions, mounting brackets, plus all necessary screws & bolts (less motor & wood for wood parts) **$25.95**

GIL-BILT Plans #510, Full Size Patterns, Installation Instructions 1.00

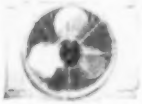
GIL-BILT 24 INCH WINDOW FAN

- Two heavy OILITE oilless bronze bearings
- 24 inch TORRINGTON 40 degree pitch aluminum blade
- Pedestal mount for blade and pulley simplifies construction. Shipped ready to run.
- Mounts out of way on outside of window.
- Belt driven with any 1/6 or 1/4 h.p. motor.
- Rubber cushioned mounting brackets reduce noise, simplify installation.
- 5000 C.F.M. at 620 r.p.m. cools 4 or 5 room house.

GIL-BILT KIT #520-A Includes Plans, TORRINGTON rustproof blade and V-pulley mounted ready to run on cast aluminum pedestal, V-belt, motor pulley, mounting brackets, plus all necessary screws and bolts (less motor and wood for wood parts) **$19.95**

GIL-BILT Plans #520, Full Size Patterns .50

GIL-BILT 20 INCH ROOM COOLER FAN



- Complete fan shipped ready-to-run. Cut out plywood panel and bolt to fan guard with four bolts.
- Direct drive nationally known REDMOND motor complete with cord and two-speed switch.
- Precision balanced TORRINGTON blade.
- Sturdy wire guard, rubber mounted to minimize vibration.
- 3000 Cu. Ft. of air per Min.
- Build to fit any window 24 inches wide or over

GIL-BILT KIT #510-A. Includes Plans, all screws and bolts. Motor, blade, guard, switch, and cord shipped completely assembled ready to run (less wood panel) **$28.95**

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NO DEALERS (Use Use Factory Price! Prices include postage within 600 miles. Over 600 miles add 5%. Send cash, check or money order for fan kit, or send for Plans now and order Kit later less cost of Plans. Write for free descriptive folder

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Now **10 FEET** *long!*

Yes, here it is—that extra length you've always wanted...120 inches of accurate, more useful measuring ease. Jet black markings on a wear-resistant, acid-resistant snow white blade.

Carlson quality throughout with famous 10-second blade change economy and the new convenient swing-tip....a real value at YOUR HARDWARE DEALER. Just be sure it's the *White Chief* by Carlson.

P.S. And don't forget to get an extra blade to keep on hand as a "spare."

Blade produced under Pat. No. 2[illegible]

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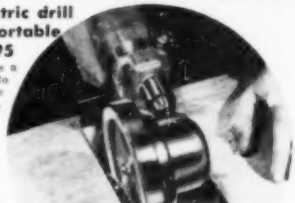
CARLSON & SULLIVAN, INC.

MONROVIA, CALIFORNIA

CARLSON

MEET THE NEW BULL SAW!

Convert your electric drill into a powerful, portable saw for only $9.95



Your electric drill becomes a portable saw with power to spare when you attach the new Bull Saw! It's sturdy, rigid—yet light enough for one-hand operation. New visual guide lets you see where you're going; new extra wide shoe plate keeps saw blade on the straight-and-narrow. One-piece safety guard of polished aluminum . . . . blade of high carbon steel . . . double bearings for long life. Fits rigidly on any 1/4" electric drill. Depth of cut 1 3/8". Complete, ready to use in drill. (When ordering, ask for Model BS-C) **$9.95**

IF YOU ALREADY OWN A BULL BUFFER

you can make your own Bull Saw for only $7.50! Here's how: order the saw housing (photo 13) and attach it to the anglehead of your Bull Buffer, following the simple directions we send you. That's all—it only takes 30 seconds to change your Bull Buffer into a powerful, portable saw! The housing you need comes complete, only . . . **$7.50**

(When ordering, ask for Model BS-H)

COMPLETE POLISH-SAND-'N-SAW KIT

Includes (photo 2) Bull Buffer*, famous right-angle polisher-sander complete with rubber pad, sheepskin bonnet, 2 sanding discs and (photo 13) Saw Housing that fits on Bull Buffer angle head to give you a powerful Bull Saw. A $19.90 value, yours for only **$14.95**

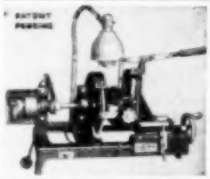
(When ordering, ask for Model BS-K)

**Bull Buffer only, with sheepskin bonnet and 2 sanding discs, $8.95.*

At your dealer, or send cash, check or M.O. for prepaid shipment

BERTRUM G. ENGINEERING CO.

3121 MAIN STREET KANSAS CITY, MO.



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Your Finest Buy for HOME, FARM, WORKSHOP!

ELECTRIC HOME-UTILITY TOOLS

DRILLS • SAWS • SANDER-POLISHERS

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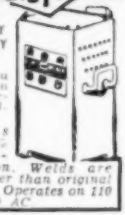
ARC WELDING FOR PROFIT OR PLEASURE

60 LBS. OF READY MADE PARTS Only $24.95

BUILD YOUR OWN HEAVY DUTY WELDER

SAVE BUY ONLY NECESSARY PARTS



All parts Ready-Made and easy to assemble. You can do all around welding on steel, cast iron and other metals after only a few hours practice. Illustrated Instruction manual included. Sold on 30 Day Money-Back Guarantee!

FREE: Write today for fully illustrated Pamphlet S-6.

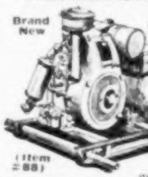
Gives 100% penetration. Welds are stronger than original metal. Operates on 110 or 220 AC.

ATOMIC ARC WELDER CO.

1039 So. 19th St., OMAHA, NEBR.

SAVE ON THESE BRAND NEW **WAR SURPLUS BARGAINS** UNCONDITIONALLY GUARANTEED

AUXILIARY ELECTRIC GENERATING PLANT



Brand New

(Item #88)

For General Utility and Emergency Use

2500 WATTS—115 VOLTS—60 CYCLES A.C.

Plenty of current to operate your: Oil Burner, Sump Pump, Refrigerator, Home Freezer, Power Saw, Lights, Radio and Television, Home Water System Pumps.
Complete integrated heavy duty electric power plant. Signal Corps Model PE-75, driven by Briggs & Stratton, one cylinder 6½ H.P. Model ZZ, 4-cycle engine with killer button, oil bath air cleaner, governor, muffler, starting rope, and radio interference filter. The self-excited Leland or Westinghouse generator is rated 2500 Watts, 115 Volts, 60 Cycle A.C. single phase, belt driven, with guard and duplex receptacle. When generator is not in use, you can use the engine separately to power other equipment. Mounted on adjustable steel skids, notched for carrying poles. Net wt. 310 lbs. Shpg. wt. 440 lbs. Dimen. 36" x 19½" x 24". 12 month guarantee. $726.00 value. NOW **F.O.B. Chicago** **295.00**

AIRCRAFT QUALITY HYDRAULIC CYLINDERS

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes . . . including actuating and double action cylinders, control valves, tanks, pumps, fittings, hose, and data on hydraulic applications. Use these positive, highly efficient, smooth pressure hydraulics on presses, arbors, lifts, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #4—All steel double action hydraulic cylinder, 1½" bore, 27⅞" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. **F.O.B. Chicago** **4.95**

ITEM #33C—Double action hydraulic cylinder, 1½" bore, 4½" stroke. Clevis mountings at both ends. Uses ¼" pipe fittings. **Postpaid** **8.95**

ITEM #32—Double action, 1½" bore, 9" stroke, will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 4 lbs. A $45.00 value. **Postpaid** **10.95**

(Item #42)

ITEM #41—Double action hydraulic cylinder, 2" bore, 6" stroke, clevis mounting at base and end of shaft. Overall length closed 12½". Has ¾" stainless steel shaft, uses ¼" tubing fittings. Will lift up to 3100 lbs. with 1000 P.S.I. line pressure. Weight 7 lbs. **Postpaid** **12.50**

ITEM #16—Double acting cylinder, 1½" bore, 27" stroke. (Will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 8 lbs. A $55.00 hydraulic cylinder value for only **Postpaid** **12.95**

ITEM #15—Double acting cylinder, 3" bore, 8½" stroke. All steel hydraulic cylinder, will lift up to 7000 lbs. with 1000 P.S.I. line pressure. Wt. 12 lbs. A $78.00 value. **Postpaid** **19.50**

ITEM #31—Double acting cylinder, 3½" bore, 11" stroke. Will lift 9000 lbs. with 1000 P.S.I. line pressure. Wt. 15 lbs. A $92.00 value **Postpaid** **22.50**

ITEM #6—Double action, 3" bore, 23" stroke, hydraulic cylinder will lift 7070 lbs. with 1000 P.S.I. line pressure. Especially suited for farm and construction machinery. Clevis mounting for easy use. Wt. 22 lbs. A $154.00 value **F.O.B. Chicago** **27.50**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 P.S.I. line pressure is 12,500 lbs. Ship. wt. 30 lbs. AN EXCELLENT VALUE for **F.O.B. Chicago** **32.50**

HI-PRESSURE FITTINGS for cylinders and valves available at 35c ea. for ⅜" pipe and 50c ea. for ½" pipe.

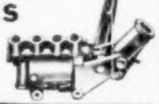
LOGAN HEAVY DUTY

HYDRAULIC PUMP

(Item #29)

For operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 8 GPM at 1200 RPM at 1000 P.S.I. using 5 HP. Has ½" pipe thread ports. Rotate in either direction. Also use as hydraulic motor. ¾" shaft with flat and keyway for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5½" H x 5½" W. A $105.00 value FOR ONLY **F.O.B. Chicago** **22.50**

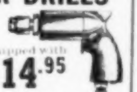
HAND HYDRAULIC PUMPS



Item #11—Postpaid **8.95**

Item #83—Hand hydraulic pump with built-in transfer valve. Postpaid **12.95**

PNEUMATIC AIR DRILLS



Used—Like New Light, powerful, compact, pistolgrip, trigger control. Ideal for shop use where air pressure is available.

ITEM #80—Ingersoll-Rand. Equipped with ¼" Jacobs key chuck. Overall dimen.: 6½" long, 5" high, 1½" thick. Wt. 3 lbs. **F.O.B. Chicago** **14.95**

ITEM #81—Chicago Pneumatic. Larger Size, Model A, equipped with ¼" Jacobs key chuck. Overall dimen.: 7½" long, 5" high, 2" thick. Wt. 4 lbs. **F.O.B. Chicago** **19.95**

LOGAN HEAVY DUTY

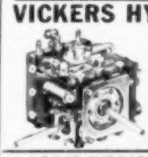
HYDRAULIC CONTROL VALVE

(ITEM #37)

Has built-in adjustable relief valve, will operate one double-acting hydraulic cylinder or two cylinders as one or a reversible hydraulic motor. Valve handle latches in neutral position. Made of rugged cast aluminum alloy. Open center unloads the pump in neutral position. Throttling control allows operator to regulate the speed of movement of the hydraulic cylinder or motor. Has removable mounting brackets with 4 bolt holes, ⅜" pipe thread connections. Overall dimen.: 12½" H x 8½" D x 8" W. Ship. wt. 17 lbs. Govt. Acquisition Cost over $100.00. An Excellent Buy **F.O.B. Chicago** **21.95**

VICKERS HYDRAULIC TRANSMISSION

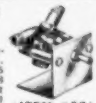
MODEL AA16801A



Ideal for lathe drive, miniature cars, power machinery, gearing, etc. Rated 2 HP maximum input at 1750 RPM. Output speed continuously variable from 0 to 1⅓ of input speed in either direction. Self contained reservoir. All controls external. Even power at all speeds. Complete with two ½" shafts with flat for pulley attachment. Ship. wt. 20 lbs. Gov't. acquisition cost $125.00. A tremendous value at (ITEM #85) F.O.B. Chicago **25.00**

VANE TYPE—MANGANESE BRONZE

INSECTICIDE PUMP



(ITEM #50)

For spraying DDT, 2-4D, sulphur compounds, arsenic, oil solubles, etc. Pressures up to 200 PSI delivering 5 gallons per minute at 1200 RPM, 8 gals. per min. at 1800 RPM. Will not rust, pit, foul or freeze up. Standard 1" pipe thread ports. Rotation—either direction 9"x6"x7". Shpg. wt 10 lbs. Gov't. acquisition cost $42.00 NOW **15.00**

Free: Complete instructions and performance data with each pump. F.O.B. Chicago

A.C. GENERATOR

(Item #67)

750 Watts 115 Volts 60 Cycles

Manufactured by Eicor, rated 750 watts at 1800 R.P.M. Complete with voltmeter regulator; 1" shaft, with keyway for direct or belt drive, carried in one bronze and one ball-thrust bearing. These units, built to exacting Signal Corps specifications, are the answer to your lighting needs. Shipping wt. 60 lbs. **F.O.B. Chicago** **59.50**

FOR ANY WELDING JOB, LIGHT OR HEAVY

Designed for many years of trouble-free service. Handles anything from light gauge sheet metal to ¼" plate.

This precision-engineered Direct Current ELECTRIC ARC WELDER is offered at but a fraction of its original value. It can be mounted permanently or easily transported for portable use. Does the job instantly, where and when you need it.

The War Surplus generators for these Arc Welders were built by General Electric, Westinghouse, and Delco-Remy at a cost of over $___. They are light in weight; have oversized lifetime grease-sealed ball bearings; air-cooled commutator; dial type rheostat for easy pinpoint control; high-low range switch; reactor coil for even arc; handles 1/16" to ¼" rods. Run welder at 2500 R.P.M. from drive pulley or power take-off of tractor, a 7½ H.P. electric motor or a 10 H.P. gas engine. Use two V-belts, or flat belt (on pulley). Continuous welding rating 200 amps., intermittent rating 250 amps.; 0-30 volts. Now . . . AT A FRACTION OF ITS VALUE. Price includes double V or flat belt pulley and instruction book. Ship. wt. 107 lbs. Only one or two jobs will pay for entire welder. **F.O.B. Chicago** **99.50**

ACCESSORY KIT including welding helmet, electrode holder, two 10 ft. cables with clamp, and 5 lbs. of assorted welding rods. **(ITEM #66)** **F.O.B. Chicago** **10.50**

Remember, Satisfaction is Guaranteed

PUROLATOR OIL FILTER

PERMANENT TYPE

The perfect oil filter to keep your motor oil or hydraulic fluid clean at all times. Protect your pump or engine with this unit. Just turn the handle and the element is clean. Standard ¼" inlet and outlet ports to accommodate 12 gallons per minute. Shipping wt. 4 lbs. A $13.00 value **(Item #70) New Postpaid** **4.95**

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APPLICATIONS: Oil burners, aquariums, fluid metering, fuel pump, tool post grinder, coolant pump, pressure lubricating pump, general industrial, etc.

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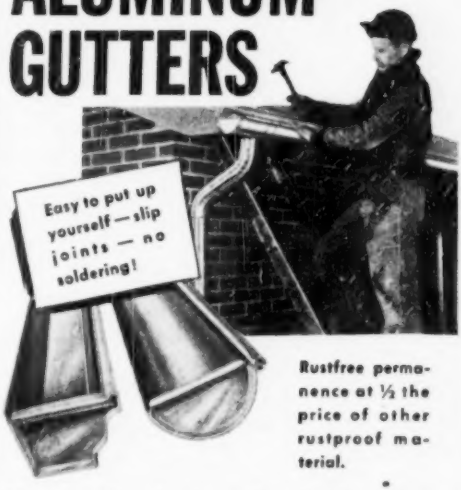

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Like magic it reflects up to 95% of radiant heat. Aluminum foil bonded to kraft paper. Just tack or staple up. Rolls—250 sq. ft., 25", 33" and 36" wide.

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5/16 x 5/16 x 2½" 8 Pieces	**$1.79**	⅞ x ⅞ x 4" 4 Pieces	**$1.95**
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Male, MT	Female, MT	Price
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BRAND NEW CARBON EXPANSION REAMERS

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Maximum expansion for these reamers is .010 above size stated.

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With check valve type seat. Ports at 90°. ⅜"—18 thread. Can be adjusted between 1200 and 1250 P.S.I. Priced at only **$2.00**

Valve same as above with ½" pipe connection. Adjustable between 200 and 500 lbs. Brand new priced at only **$2.00**

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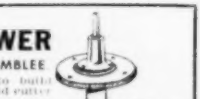

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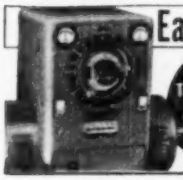

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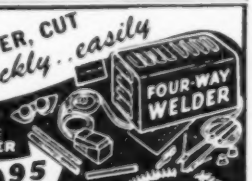

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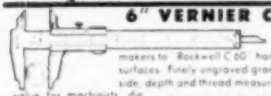

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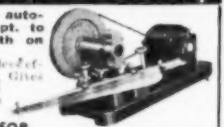

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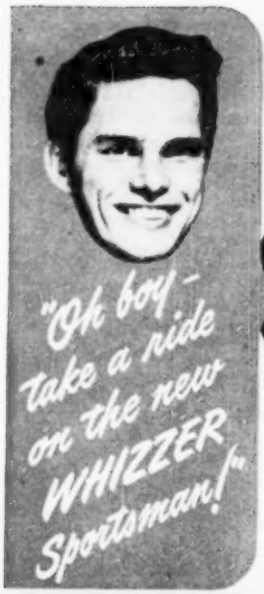

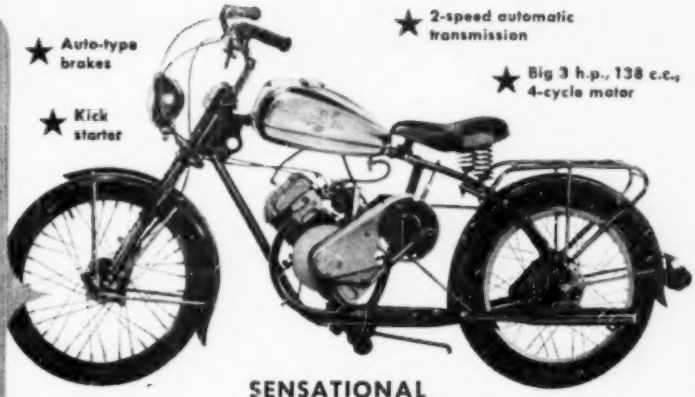

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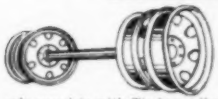

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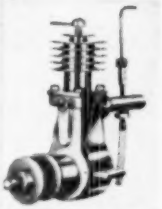

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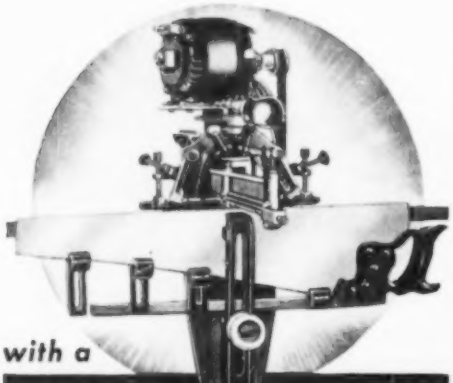

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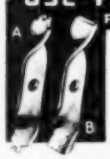

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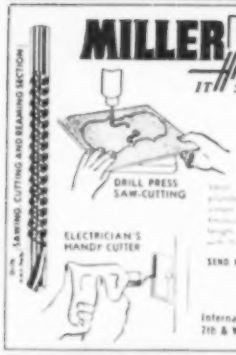

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7th & Wyandotte PS-4 Kansas City 6, Mo.

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PAINTERS' STRIPING TOOL

NOW you can do your own expert striping on furniture, bikes, model planes, bulletins, autos, toys, signs, linoleum, wall board . . . make plain walls look like tile! It's easy to paint straight, curved, circular, even parallel lines with any color. Handiest paint tool in your workshop! Type "M" Master Painters' Striping Tool complete with tip for 1/16" stripe, $1.00. Other tools complete with following tips: 1/64", 1/32", 1/16", 1/8", 1/4", 3/64", 3/32", 1/8", $1.50 ea. Extra tips 75c ea. Entire kit with tool and 7 tips, $5.00.

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Turns motors, or electric drills into flexible shaft tools! Pencil-size handpiece, 35" overall length. Attached or removed in a jiffy. For use on motor add 50c for coupling available for 1/4, 3/16, 3/8, 1/2" motor shafts. Write for catalog 1030-E.

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Don't split wood—Use "CHEVRONS". New steel fastener for wood joining (miter joints). Draws wood together eliminating doweling, mortising, ball-nut. Hammer in—"Presto"—firm joint. No wobble, distortion. Fastener lends artistic appearance. Can be counter-sunk, concealed, on hard wood where others fail. For mill workers, artisans, HOME CRAFTSMEN for repairing screens, doors, sash, frames, cabinets, furniture, moulding. Hurry—Send **ONLY** 75c for box 100, ⅝" depth, suitable for thickness of wood up to 11/16 inch, or $1.00 for GIANT-Size box NOW! Money back if not delighted.

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Mention year and make of your car, truck or tractor.

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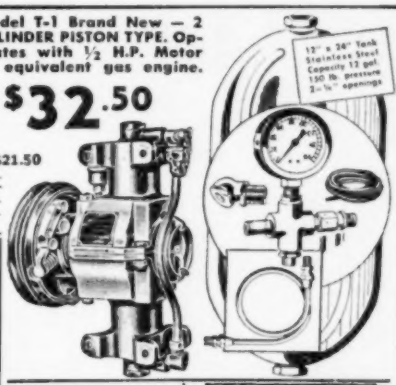
405 College Street • Bowling Green, Ky.

"Wellworth" Sensational Offer! Reg. $60.50
WESTINGHOUSE AIR COMPRESSOR

Model T-1 Brand New — 2 CYLINDER PISTON TYPE. Operates with ½ H.P. Motor or equivalent gas engine.

$32.50



Compressor, pressure tank, air gauge, air chuck, 20-ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples. COMPLETE OUTFIT, wt. 52 lbs.

Equipment less Compressor, $12.50. Compressor separately, $21.50

Compressor has 2" bore, 1½" stroke, ball bearing, 3.27 CFM at 600 R.P.M. Capacity up to 6.54 CFM. Size 9"x11⅞"x6⅝". Wt. 26 lbs. Ideal for spraying paints, insecticides, etc., inflating tires, operating air tools, and other uses. All new equipment. U.S. government surplus. Replacement parts available. Amazing buy. Don't miss it.

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Same as high power line
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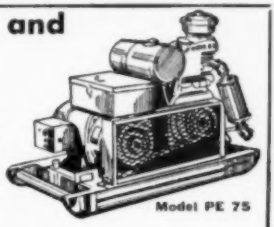
Advantageous purchase from U. S. government enables us to offer this great bargain. Ideal for farms, homes, garages, shops, etc. Will operate oil burner, deep freeze units, compressors, saw, pumps, radio and sound systems and general lighting.

SPECIFICATIONS: 115 Volts, single phase 2500 watt, A.C., 60 cycle with 25% reserve power. ENGINE: Briggs & Stratton, Air Cooled, 6½ H. P. LELAND GENERATOR. "V" Belt drive with guard, and Duplex Receptacle plug-in. NET WT. 310 lbs. Shipping Wt. 440 lbs. Brand New! Complete with spare parts, tools, instructions. **Fully Guaranteed.**



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A handy buyer's guide for home and factory workshop. Unusual bargains in motors, air compressors, electric tools, and many more items. Send 10c for postage and handling.

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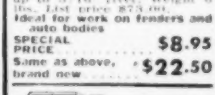
Used—Like New!

CHICAGO PNEUMATIC RIVETER & CHIPPING HAMMER
CP4X Pistol grip handle. Takes up to 3/16" rivet. Weight 6 lbs. List price $73.00. **Ideal for work on fenders and auto bodies**

SPECIAL PRICE **$8.95**
Same as above, brand new **$22.50**



Used Like New **Ingersoll Rand AIR DRILL** Lever or Pistol type with ¼" Jacob Chuck. Wt. 2 lbs. List price $55.00. Only **$14.95**

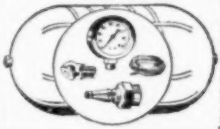
"Wellworth" BLOWER

Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft.
DIMENSIONS: 10" wheel; outlet 13¼" x 11¾"; Inlet 8¾"; Height 19"; Width 18"; Depth 16½"; C.F.M. 14" S.P. 1600; outlet vel. 1575; motor ¼ H.P. with overload relay; cord & plug, 110 v. 60 cy. AC. Ship. Wt. 67 lbs.
Bargain price **$39.50**
Same as above

"WELLWORTH" V-BELT CLUTCH

Takes starting load off engines or motors. When speed is reached, a flip of handle shifts clutch from idling to driving position. Handles "A" belts, 2.35" pitch diameter, ⅝" bore. Ideal for use with lawn mowers, garden tractors, home workshop motors, etc. 3¼" long. Safe, easy to mount, sealed bronze bearings, positive action. Shpg. wt. 3 lbs. **$7.50**

AIR TANK and ACCESSORIES



Air receiver, stainless steel, 12½"x24", 400 lb. test. Ideal for carrying on trucks, autos and wherever compressed air is needed. Equipped with 500 lb. air gauge, tire chuck, 3 ft. high-test air hose, air inflation valve with core for retaining pressure in tank, and fittings. Two ¼ openings.
Complete outfit **$7.95**
Shipping wt. 20 lbs.
Same unit but with 6" x 24" tank **$6.95**

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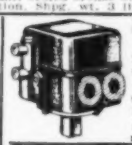

For Air or Water

20 to 40 lbs.	$5.50
75 to 100 lbs.	7.50
125 to 150 lbs. with unloader	10.25
¼" check valve	2.75
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Prices f.o.b. Chicago. Immediate delivery. All items sold on money back guarantee. Send check or money order today.

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New BELT SANDER ONLY $10.95

MODEL 324

Stationary and Portable

Ideal all-purpose sander for home or shop! Stop Fence Unit adjusts to 4 positions — tilts to 45°. Sturdy aluminum construction. May be powered by electric motor, drill, lathe, etc.

Send for free circular **NOW!**

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HIGH POWER TELESCOPE

60 POWER-ALUMINUM TUBES-OPENS TO 33"

Variable Power Eyepiece Adjustable to 15X, 30X and 60X.

$4.50

Leather Case Included

5 Sections. 4 Ground & Polished Lenses. Also used as 50X Microscope. Ready to use, only $4.50 POSTPAID.

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DOES WELDING, BRAZING, SOLDERING, CUTTING

It's the finest, precision built heavy duty transformer-welder available for home, farm, or shop use. Does work you'd expect from costlier machines. EASY TO OPERATE. Do expert work; follow simple instructions. Works on iron, steel, brass, bronze, aluminum and other metals. Operates from any properly wired 110 volt 50/60 cycle AC line. Save time, Make money—Build or repair auto, home, farm or shop equipment, etc. for yourself and others in spare or full time. Comes complete Ready-To-Operate. Order today for 10 day trial on money back guarantee or write for Free Particulars.

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72 pages of Machine Tools (taps, drills, dies, reamers, etc.) Hydraulic cylinders Air tools. Send 25¢ for your copy today.

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Kiddie Lux CO_2 Type. Built to Gov't spec. Shatter-proof, heavy case. Fully charged with horn

No.602A – 7½ lb. $35 Value. **19.25**
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Note: Weights listed are capacity extinguisher charge.

PRESSURE FEED PAINT TANK

BINKS MODEL Q – TYPE D-5307... For conveyance of large quantities of paint or finishing materials to the spray gun. Keeps the material under constant pressure & agitation at all times. Consists of 10 gallon tank with air motor, agitator, safety valve air regulator & a 150 PSI gauge.

125.00

SPEEDY SPRAY TANK – For full pressure painting or spraying systems.. Holds 3 gallons of material. All steel construction with brass hose fittings and relief valve. Easy to clean and fill. Has carrying handle and 10 ft. of air and paint hose.
Complete Only **18.95**

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High Pressure
General Electric, 2 stage AC - DC. Rated pressure 1000 lbs. per sq. in. with 1/3 H.P. 27 volt, 7 AMP series wound motor with fan for cooling. Thousands now in use for spraying, inflating, laboratory use, etc. Can be adapted to 110 volt A.C. with transformers

A tremendous value at approx. 5% of original cost **22.50**

We also have transformers for above.

TINY MITE WINCH HOIST

This mighty little giant lifts up to 1000 lbs. with its 30 to 1 Bronze Gear drive. Cable drum is 4" x 1½". Ratchet handle – Safety and release pin. Ideal for Boats, Farm, Factory, Home or Garage. Save your back for **10.49**

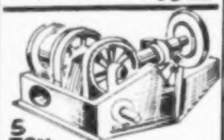
6 in1 HAMMER

A very handy household or shop tool for man or woman. Ideal for hundreds of Fix-it jobs. Has 4 graduated screwdrivers in the handle, from 1/8" to 5/16" Steel hammer head & knurled brass handle. A Bargain at .... **89¢**

¼" HEAVY DUTY MALL or THOR Electric Drills

A 35.00 VALUE 17.95

Again we are able to offer a limited supply of these Genuine Gov't Surplus Drills. Made to take the most rugged abuse. Used but in excellent condition. 110V A.C.-60 cycle-1 phase, Ball Bearing Motors turning 2500 R.P.M. Finest 1/4" Jacobs Chuck ....
DON'T MISS THIS BUY!!!



5 TON POWER DRIVE HOIST

Here's a real, rugged power unit! Combines a cable drum winch with a separate power pulley drive & 2 individual, 1½" square power take-off shafts. A "throw-in" clutch operates the winch & both take-off shafts. Ideal for use on trucks or boats or as a stationary hoist. . . . .
A $300 VALUE for .... ONLY **79.89**

We've gone NUTS!!

Just Purchased 100,000 lbs. of the FINEST PRECISION Made ELASTIC & FIBER LOCK NUTS!! All are NEW!!

Here's your chance to "STEAL" Aircraft Quality STOP NUTS at less than the cost of common commercial hex nuts. They're ALL NEW Cad plated Steel and a large quantity are even pre-tapped for easier wrenching. ELASTIC or FIBER LOCK SEAL gives a Positive .. Shake-proof .. Vibration & Rust Resistant fastener. No lock washer necessary .. One operation does the job. Just run on the nut. Ideal for use in all types of metal fabrication, assembly, construction etc.....

AND LOOK AT THESE PRICES for ELASTIC or FIBRE LOCK NUTS

Prices per 100 in these quantities - Special Discount for larger quantities -

	100	1000	10,000	25,000	50,000	100,000	500,000
640	$.49	$.25	$.21	$.19	$.17	$.15	$.13
836	.59	.31	.28	.25	.23	.21	.19
1032	.59	.31	.28	.25	.23	.21	.19
1/4-28 FL	.63	.39	.36	.33	.30	.27	.25
1/4-28 PT	.63	.39	.36	.33	.30	.27	.25
5/16-24 PT	.84	.64	.61	.58	.56	.54	.49
3/8-24 PT	.94	.74	.71	.68	.66	.64	.59

Note: FL means Fiber Lock (not pre-tapped.) PT means Pre-tapped, ESSNA Brand.

SAVE! SAVE! SAVE! – We have TREMENDOUS quantities of AIRCRAFT Quality BOLTS – SCREWS – RIVETS & BEARINGS. Our huge stocks include a great variety of sizes and lengths. PRICED LOWER THAN YOU PAY FOR ORDINARY COMMERCIAL QUALITY!

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For Wagons, Dollys, Handtrucks, Wheelbarrows, etc. 10" dia., with 1/2" center hole. (can be drilled out to take 5/8" axle) Wheel is 1/8" steel with 10 x 1.75 heavy duty, semi-pneumatic cushioned rubber tire........ ea. **$1.75**

2 TON WINCH

Can be Hand or power operated.
Has large capacity steel drum for cable. Powerful gear – reduction drive and manual brake. **36.50**

BEADING TOOL

Made for the U.S. NAVY. For turning an edge bead on all kinds of metal up to 18 gauge thickness. Has high grade steel faces, hardened & polished. Easily removable from shafts. Back gearing drive is enclosed in case. Top shaft adjustable for thickness & pressure. 5 faces furnished include Nos. 0 – 01, 1, 2 & 3. Has 1-1/4" hexagon shaft for bench mandrel. **17.95**

NAVY PULLEY BLOCK

Big, rugged blocks. Contain 2 pulleys in heavy duty, reinforced steel frames. Designed by Navy for heaviest lifting operations. Will take rope or cable tackle up to ½" dia. Drop forged steel hook.
4" pulley dia. .. 2.75
6" pulley dia. .. 3.95

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6 DIFFERENT TYPES 6

Contains 1 each of the following items.
Flight Check-off • Position Indicator
Selsyn Fuel Gauge • Air Speed Indicator
Fuel Air Ratio • Oxygen Regulator
These instruments contain sensitive meter movements, jewels, bearings gears & valves.
COST THE GOV'T MORE THAN $500.00
SPECIAL!! ALL 6 FOR ONLY **5.95**

METAL SNIPS–Hardsteel blades. Comp'nd action. Expansion spring & lock'g device. Right and Left hand types .. **$2.59**

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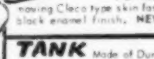

For inserting and removing Cleco type skin fasteners. Heavy black enamel finish. NEW **69¢**

NEW CLAMP

Carpenters, Cabinet makers, Wood workers you need this one! Opens to 8" with 2 3/4" thumb screw. All Steel sturdy and dependable.
Handy for gluing, etc. ONLY **$1.59**

UTILITY HAMMER

For use as masonary chisel, stake driver, sledge, etc. Head is special forged steel, with sharp cutting edge. Handle is select hardwood.

1½ lbs. with 14" handle .. **79¢**
2 lbs. with 21" handle .... **99¢**

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Made of Dural. Has welded seams, 2" filler with cap, and two standard pipe ports for hook-up. Visible liquid level gauge on one side. An ideal tank for Gas, Oil, Water or as a "spare" on your auto, tractor, truck, boat or plane. Sturdy–Lightweight. **4.95**

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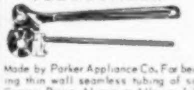

Made by Parker Appliance Co. For bending thin wall seamless tubing of soft Copper, Brass, Aluminum Alloy or fully annealed steel. Ideal for Plumbers, Auto & Aircraft Mechanics, Steam Fitters, etc. Makes bend from 0 to 180 deg.

No.5 – 5/16" Capacity ... **5.45**
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Ideal for Insulating or Bushing Stock. 36" x ⅛" wall x 1" O.D. Original use was for trailing antenna – F 10. Use for towel rack, bearings, etc. **59¢ ea.**

RUBBER

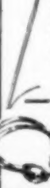
Neoprene Sheet Stock

	Thickness	Approx. Width		Price per run y.d.
#325	.020	1 64"	36"	$1.75
#328	.032	1 32"	22"	1.20
#330	.064	1 16"	36"	2.39
#331	.093	3 32"	36"	3.29
#329	.125	1 8"	46"	4.75

Note: No. 329 is Laminated rubber sheet with cloth center. Flexible & very fine for heavy wear.

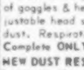
No. 332 - Grey Neoprene Rubber Floor Mat. Has raised non-skid Diamond pattern with durable cloth backing. Stock size 36" x 36" x 1/16" thick **$1.95 ea.**

GROUND ROD



Made by a leading manufacturer of electrical conductors. This rod is all new and in excellent condition. Most commonly used as ground conductor on high power lines, telephone poles, etc. Has solid iron core covered with non-rusting Copperweld. **1.00**

COMFO RESPIRATOR



Approved by the U.S. Bureau of Mines for DUST and MIST! Very high filtering efficiency is obtained thru unusually large filter area. New cushion face-piece fits comfortably and permits the wearing of goggles & helmets. Easy vision – adjustable head strap. Single filter for all dust. Respirator plus 10 extra filters. Complete ONLY ... **1.59**

NEW DUST RESPIRATOR

M-1 Valve Type. Rubber on inside, felt filter outside. Rubber valves. Adj. headband. Light–Comfortable. .. **29¢**

We stock other respirators. Write for list.

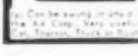
RAWHIDE MALLET

Weight 2½ lbs. Has metal collar with rolled leather insert head. Used for working soft metal, plastic, driving pins, etc. Leather is replaceable. ONLY **1.09**

RADIO HEADSET

Excellent condition. Low impedence. Adjustable leather covered headband. Ideal for amateur radio.
Only **1.59**

New SUN VISOR



Made of clear green plastic. Adjustable arm & swivel head. Holds firmly. Can be swung in any position. Made for the Air Corp. Very useful on your Car, Tractor, Truck or Boat. **1.29**

U.S.NAVY PHONE SETS

Used by the Navy for Flight Deck & Gunnery Control. Each set is complete with 2 phones, mounted on chestplate, 2 headsets, battery cases, push-button switches & 35 ft. of cable. Can be used successfully up to 1/2 mile distance. Set is sound-powered needs no battery.
Ideal for home-to-garage, house-to-barn, office-to-shop, etc. You'll find many uses that make these worth much more than our price. Set of two **7.95**

Same as above but uses 2 flashlight batteries for power....... Set of two **7.25**

Order from this Ad. All sales final. All Prices F. O. B. Glendale. Pay by M.O. or Check. P.O.'s Accptd. from D & B. firms. ½ deposit with C.O.D's.

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PALLEY FAMOUS MIXES!! Prepared especially for the HOME CRAFTSMAN, HOBBYIST, INVENTOR, GADGETEER or SHOP MECHANIC.
GADGET MIX – Rivets, Spacers, Bolts, Screws, Gears, Wheel bearings, Springs and Clamps. No. 106, 5 lbs. 1.19
BEARING MIX. No. 170A. Approx. 20 needle, Ball & Roller Bearings, New & Used. Sizes: 1/2" to 4". Some of these cost Gov't $10 a piece. Never such a value! 5 lbs. ONLY 1.59
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SPRING MIX, No. 206 – Torsion, Compression & Tension Springs. Asstd. sizes. A treasure trove for emergencies. 5 lbs. for ONLY 1.69
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FILE MIX – Ten assorted Files, 4" to 12", includes 3 Vixens, half rounds bastards, mills, etc., in seconds and used but in good condition. 1 Vixen alone worth our price for entire mix. F-1 99c
PULLEY MIX, No. PM-1 – You'll want this one around. 10 micarta & metal pulleys ranging from 1" to 5" with ball and one piece bearings. These are aircraft pulleys, the best made with 100's of uses. A WONDERFUL BUY!!! 2.95
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NUT MIX NM-1 – 3 lbs. approx. 500 nut Anchor, Lock, Castle, Hex, Elastic Stop Nuts, etc. You'll always have plenty of Nuts in the shop. NM-1 1.39
SUPER COMBO MIX – No. SC2. Here's a real bargain. All eleven above mixes for ONLY 14.95
REAMER MIX – No. 168. Reamer assortment. Special Taper line finish Reamers. High Speed Steel. Slightly used but in excellent condition. Ten assorted sizes ranging from .168 x .165 & .244 x 215 to .425 x .385 & .432 x .403. One alone worth our selling price of ten. For set of ten Reamers . . . 4.49
PLASTIC MALLET CLEAR PLASTIC with 2" dia. x 4" head & 12" handle. For soft metal or plastic work where non-marking or light tapping is desired. 79c ea.
15 MONKEY WRENCH
Adjustable Jaw – Opens to 4"
Drop Forged. . . Auto Type.
Cadmium Plated 89c Black 79c
PIANO HINGE
Overall | Width | Length | Price Ea.
1½" (5/8" side) 72" alum. $1.00
2" (1" side) 9' alum. $1.75
3½" (1-3/4") 54" st. steel $1.69
BRASS HINGE – 1½" (5/8" side) .040
Any length at . . . . . 29¢ per ft.
PALLEY SUPPLY COMPANY
6321 SAN FERNANDO RD.
DEPT. PS-6 GLENDALE 1, CALIF.
JUNCTION BOX
Formerly used in aircraft electrical circuits. Have many uses around home & shop. All brand new!!
13¼" x 11½" x 4" — .064 Alum. $2.75 ea.
12½" x 10¼" x 6" — .064 Alum. $2.69 ea.
7½" x 5" x 4" —— .040 Alum. 99¢ ea.
HANDY REPAIR KIT
Here's one for every purpose 6 useful tools... a steel trimming knife – pair of genuine WISS Heavy Duty scissors – a sealing roller for cementing fabrics, 2-12" half round files & a burnishing brush. Ideal for wallpaper, linoleum, etc. Comes in compact cloth roll. A 9.50 Value For 3.29
TACHOMETER – Type C-9A. Operates on direct drive with flexible shaft. Range is 0 to 4500 RPM. Ideal for use on single engine planes or boats, autos, etc. Drives direct from camshaft or at 2-1 reduction from crankshaft. $4.75
Sperry Aircraft Directional GYRO COMPASS
Dial is 360° swing calibrated 1/10° (6 min). Panel Mount 4½" square with 3" luminous dial. Can be used in autos, planes, or boats by attaching one tube to intake manifold for required vacuum. Complete with reset caging knob. Gov't. overhauled – ONLY $4.49
NEW ELECTRIC MOTORS
No. 500 – New ½ HP – 27 Volt DC-AC. This motor can be readily adapted to deliver up to ½ HP on 110 Volts AC by the simple method of rearranging armature brush-leads. Free diagram with each order. A sensational Value $5.95
No. 500-A – Converted to 110 Volts-AC Equipped with plug and 3½ ft. Heavy Duty Cord . . . . $8.49 ea.
No. 502 – 2 HP-24V. DC Motor Used 8.95
U.S. NAVY BATTLE LANTERN – A powerful lamp complete with 2 1½ volt dry cell batteries. Size: –" x 7" x 4" 3.29
NEW PRESSURE TANKS
Stainless Steel, Shatterproof & Rustless. Ideal for painting, cooking, spraying, ocean buoys, underwater fishing, or diving.
G-1 – 12½ x 24 inches. 2100 Cu. In. capacity . . . . NEW 4.75
F-1 – 10 x 18 inches. 1000 Cu. In. capacity . . . . USED 4.19
F-2 – 6 x 45 inches. 1000 Cu. In. capacity . . . . NEW 3.95
D-2 – 6½ x 24 inches. 500 Cu. In. capacity. Stainless Steel Construction . . . . USED 3.49
D-2A – Corrosion resistant steel. Same as D-2 . . . . NEW 2.49
A-6 – 5½ x 15 inches. 280 Cu. In. capacity . . . . USED 2.25
A-4 – 5 x 8 inches. 104 Cu. In. capacity . . . . NEW 1.35
NOTE: All tanks listed as used are guaranteed serviceable and free from leaks or dents.
HI PRESSURE BOTTLE
Steel – Tested to 3000 P.S.I. For spray painting, portable welding, etc. All have std. pipe port.
H-3 9½" x 3¼" dia. $1.75
H-4 19" x 3¼" dia. $2.75
H-5 – 22 cu. ft. cap. internal vol. 295 cu. in. Shatterproof 20" long x 5" OD $3.75
A-2 – 3-3/4" x 16" – 96 cu. in. volume. With valve. $3.95
PNEUMATIC AND AIR TOOLS
10,000 in various popular makes, sizes, types, Cleco, Aro, Ingersol Rand, Chicago, Pneumatic, Buckeye, etc.
RIVET GUNS
Pistol & Gooseneck Type $8.95
SPECIAL
Air Drill or Air Motor with 1/4" Jacobs chuck. ARO PISTOL $17.95
NEW HYDRAULIC CYLINDER SPECIAL
Gives 20,000 lb. thrust (push pull) using 1500 PSI line pressure as obtained from our hyd. pumps. Or will produce 40,000 lb. thrust with 3,000 lb. line pressure. CAN ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS. 4" Bore, 1½" dia. piston shaft, 18" stroke, length 30½". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for road, farm & shop machinery, presses, etc. Cost Gov't $290.00 22.50
No. 9-E HYDRAULIC CYLINDER
Double action cylinder. Has a bore of 1-3/8" and shaft of 1". Stroke is 9". Overall length 15⅛". Built for 1500 lbs. continuous duty, 3000 lbs. intermittent duty. Will lift or push up to 2300 lbs. Can be adapted to hundreds of jobs. NOW 8.95
No. 3 HYDRAULIC CYLINDER –
Double action. Bore is 1". Shaft ½". Has a stroke of 2½ to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 1100 lbs. 3.75
4-WAY VALVE
Poppet Type. Valve shuts off at neutral position. Has 3/8" AC Tube Ports – 9/16 – 20 thread. Will stand 1,500 P.S.I. 4.75
BENDIX HYDRAULIC HAND PUMP
Provides an instantaneous source of tremendous power for almost any heavy work. Double action stroke. Delivers .30 cu. in. per cycle at 3000 PSI. Max. press. 5000 PSI. Built-in Reservoir cap. 2¼ qts. 3/8" pipe outlets. Has Pressure Release Valve. 7⅞" dia. by 23 3/16" overall ht. Weight 15.2 lbs. A $40.00 Value for... New $15.95
Used – In Good Condition... 11.95
D. C. GENERATORS
Suitable for adaption to home welding units, portable and rural lighting, power plant on boats, etc.
TYPE | AMPS | VOLTS
P1 200 27½ 17.95
R1 300 30 27.95
E5A 50 12 14.95
Above used, but in guaranteed condition.
03 NEW 100 24 18.95
D.C. METERS
AMMETERS VOLTMETERS
- 30 - 0 - 30 + | 0 - 120
- 60 - 0 - 60 + | 0 - 240
-120 - 0 - 120 + | 0 - 300
0-30 $3.95
Your choice 3.95 ea.
COMBINATION VOLTMETER - AMMETER
30V – 30 AMP
30V – 60 AMP $4.95
All meters 2" face except 0-300 which is 3" face.
SHUNTS – Required for use with D.C. Ammeters 30–60–120–240–300
SOLD ONLY WITH METERS $1.00
AIRCRAFT CABLE
Rust resistant alloyed steel, extra flexible, preformed – 7 x 19 strand on reels.
1/16" . . . . . . 3¢ ft. 1/4" . . . . . . 8¢ ft.
3/32" . . . . . . 4¢ ft. 9/32" . . . . . . 9¢ ft.
1/8" . . . . . . 4½¢ ft. 3/8" . . . . . . 12¢ ft.
5/32" . . . . . . 5¢ ft. 1/2" . . . . . . 15¢ ft.
3/16" . . . . . . 6¢ ft. 1/4" Bronze 14¢ ft.
1/8" Stainless Steel . . . . 12¢ per ft.
1/4" Stainless Steel . . 21¢ per ft.
Aircraft control cable 18 ft. long, 3/16 in. diam. with turnbuckle ends. 99c
TWO HEAT SOLDERING IRON
World's Hottest Iron Value!
Two soldering irons in one with button heat control. Push the button – Select 150 or 300 watt heat for light or heavy work. Complete with tip, bench holder, 5' asbestos cord. 110V AC. A $15.00 Value For . . . $3.95
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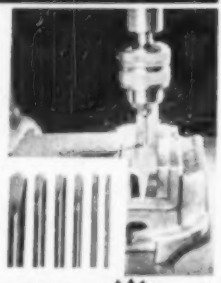
These are the very popular "price" favorite. Made similar in every detail to the genuine AAF Glasses but have a 4 base, processed glass lens. Frames are Gold Plated and have Pearlized sweat bar and nose pads. Cable ear pieces are adjustable. Complete with simulated Leather Case . . . 1.79
U.S. NAVY SUN GLASSES – With finest precision ground and polished lenses. Light weight plastic frame and leather carrying case. . Special. . 69¢
4 BASE SHOOTING TYPE GLASS – Has hardened, UNBREAKABLE LENSES. Ideal eye protection for the hunter and outdoorsman. . . . 2.79
Aviators (AN-6530) Windproof & Dustproof GENUINE GOGGLES
Rubber or chamois covered frame. Clear or Green GROUND LENSES are interchangeable. Adjustable nose bar. Ideal for Flying, motorcycling, etc. . 1.69
GG-1 GOGGLE KIT
NEW! U.S. Navy – Has soft sponge rubber frame, 4 Polaroid lenses 2 green, 1 red, 1 clear. Perfect for racing, cycling, etc. . . . . 89¢
MOSQUITO HEADNET
Protect your head and face from all kinds of stinging insects. This Jungle Headnet is made from mosquito netting & has a draw string at neck to close it tightly. Ideal for campers, Hunters, Fishermen. 69¢
New Navy Boat Fender
Here's a Real Buy! Ball type fender made of special woven Coir rope in India. Rotproof & mildew resistant. Size of ball 15". Ideal for Yachts, fish boats & tugs. 2.95
Boat Fender 21" long, 5" dia. Give your boat the protection it deserves!! These rugged hemp & manila fenders are cheap insurance. A $6.50 Value. Only 2.95
VALUABLE GEAR BARGAINS!
8 to 1 ratio, spindle drive #110 . . . . $2.98
6 to 1 with screw shaft #111 . . . . $4.98
85 to 1 (can be used for radio, antennae, etc.) . . #112 . . $3.95
#G-11 – 10-1 gear ratio $3.95
GEAR BOXES VTG-1 – 90°, bevel gear 1½ to 1 reduction, size 7" x 6". A Lifetime Value. $3.95
VTG-2 – Inline spur gear 16 to 1 reduction, thru 4 gears. Final take-off 4½" dia, 25 tooth. ¼" Alum. spur gear. . $6.49
Both above gear boxes have lever control for engaging & disengaging positive clutch. Dust proof housing. Prelubricated bearings. Both can be adapted to Vickers Transmission.
ELECTRONIC TRANSMISSION GEAR TRAIN
GT-1 Containing approx. 50 Bronze Spur & Pinion Gears – ranging from 3/8" to 4" dia., 5 sets of 7 cluster gears, 2 complete worm & worm gear drive sets, 40 N.D. ball bearings from ⅛" to 1½" dia, watch springs, bushings, posts, face plates, housings – Micro Switches, 2 miniature, controlled clutches, etc. 19lbs Of Pleasure and profit. A Tremendous Gadget Mine. ONLY $8.49
Gears in above train are all in multiple size & sequence with identical teeth ratio giving 100's of ideal gear reduction comb.
THE LARGEST FIRM OF ITS TYPE IN THE WORLD

Now... DRILL HARDEST STEEL

SOLID
FIRTHITE
Sintered Carbide
DRILLS

You can drill holes in Heat-Treated steels (up to RWC-66) with an ordinary drill press.



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STEEL AND CARBIDE CORPORATION
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$36 FOR KIT OF SIX DRILLS

Please send ☐ Firthite Drill Kit.
Single Drills
☐ 1/8", $4.00; ☐ 3/16", $4.50; ☐ 1/4", $5.25;
☐ 5/16", $6.60; ☐ 3/8", $9.00; ☐ 1/2", $10.50.
Enclose check, money order or purchase order.
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Next to a Diamond in Hardness!

BUILD YOUR OWN TILTING ARBOR SAW!

SAVE $50 OR MORE

Exclusive GIL-BILT Build-It-Yourself Features
- No machining—build easily with hand tools only
- No blueprint reading—step-by-step pictorial plans, full scale patterns, actual photographs.
- Sturdy wood, aluminum, and steel construction
- Capacity and performance of commercial saws within the reach of all.

GIL-BILT 10-INCH TILTING ARBOR SAW

- 25x28 in. table tilts in capacity in front of blade.
- 10 in. blade cuts 3¼ in. deep, tilts full 45 degrees.
- Floor model 34" high table assures stays level.
- New Departure ball bearing arbor, ¾" precision shaft turned down for ⅝" bore blades, alum. housing, shipped ready to run.
- Jackscrew and 4½ in. dia. handwheel powers and raises blade.
- Cast aluminum miter gauge and self-aligning rip fence guide.

GIL-BILT Metal Parts Kit includes Plans, ball bearing arbor, miter gauge and bar, rip fence guide, dado insert, lock knobs, jack screw mechanism and handwheel, and all other metal parts (less blade) $20.95
Same Kit with 10" Combination Blade $24.90
Same Kit with 8" Combination Blade $23.90

GIL-BILT 12-INCH BAND SAW

- Cuts to center of 24 inch circle
- Handles stock up to 6 inch thick
- 18x18 inch table tilts 45 degrees
- Lower wheel and drive pulley runs on sealed New Departure Ball bearings. Upper wheel runs on Two ¾" bore Oilite Bronze bearings.
- Upper wheel tension and tilt mechanism of cast aluminum, completely assembled.
  - Upper and lower blade guides. Each has ball thrust bearing, self-lub bronze jaws.
  - Rubber tired wheels. Choice of cast aluminum or make-your-own wood wheels on metal hubs.
- Uses standard 78 inch blades up to ¾ inch wide.
- Fully enclosed mechanism for utmost safety.

GIL-BILT Metal Parts Kit includes Plans, rubber tires, ¼ inch blade, hubs for wood wheels, ball bearing oilite tilt mechanism, guides, table tilt segments and all other metal parts $16.95
Same Kit with two machined ready-to-install 12" cast aluminum wheels $20.95

Return Kits in 10 days for refund if not satisfied.
(Prices include postage within 600 miles. Over 600 add 5%)

Also available—Plans and Parts Kit for 8" Tilt Table saw. Order Plans at $1.00 each—sent postpaid anywhere in the world or write for FREE descriptive catalog.

GILLIOM POWER TOOLS P. O. Box 1-VF, Lambert Field St. Louis 21, Missouri

New

Level Fits on Drill. A level on an electric drill was suggested by John L. McClung, of Port Huron, Mich., in "I'd Like to See Them Make," PS, Dec., '49. Now you can buy such a level from the Singer Kennedy Corp., Chicago, for about $5. This level is attached by two small machine screws. It can be adjusted to any angle from 0° to 90°. After setting the level to the desired angle, the operator watches the bubble—not the drill—keeping it centered in the glass to drill a hole at the correct angle.

Drives Screws Automatically. Screwsticks, a development of the American Screw Co., Providence, R. I., are used in this rotary pneumatic tool made by the Independent Pneumatic Tool Co., Aurora, Ill.

Screwsticks are a series of hex-head screws joined head end to thread end. The tool feeds and drives screws as fast as the operator can move from hole to hole in the work. When the tool drives a screw home, it is automatically twisted off.

Tools

Precision Screwdriver Set. Five interchangeable blades ranging in width from .100" to .040" and a nickel-plated, knurled handle are included in this set of jeweler's screwdrivers. The top of the handle swivels for convenience in running fine screws. A chuck holds the blades in the handle. Blades and handle are stored in an aluminum base. The Shadow Box, Brooklyn, N. Y., prices the set at $1.50.

Heat Gun Burns Off Paint. This flameless heat gun, made by Kinetic Laboratories, Philadelphia, quickly reduces old paint to a flaky ash that can easily be scraped off. It leaves the surface clean, without gummy deposits. It also can be used to heat plastics for bending. The unit, drawing 400 watts at 115 volts AC, consists of an electric resistance embedded in ceramic. A steel container encases the unit. Including the wooden handle, the gun weighs about 2 lb. The gun projects about 1,200° of heat and may be used for the same purposes as a gasoline blowtorch, except for brazing.

AMAZING NEW 3 SPEED

- BUFFER
- SANDER
- POLISHER

Fits Any ¼" Drill

ONLY $7.95 POST PAID

Now you can buff, sand, grind and polish at exactly the right speed. Most flexible kit ever offered. New, exclusive, 2 speed right-angle drive unit gives just the right speed for every operation—double drill speed for fast, fine sanding, ½ drill speed for added power and high lustre polishing and buffing, direct drill speed for run-of-mine work. Light and easy to use. Swivel action between drill chuck and angle drive unit permits use at any angle on any surface. Even an inexperienced operator can get professional results. Buffs, grinds, polishes, sands car bodies, furniture, woodwork, floors, metals. For home and shop use, garages, farms, service stations, machine and cabinet shops, building maintenance and many other uses. Heavy duty steel cut Zerol gears of right angle drive operate in grease-packed, sealed chamber. Will give long, hard, smooth service. Complete kit includes:

Right angle drive 2 speed unit
Flexible molded rubber head
Direct drive adaptor, cup washer, screw
Polishing bonnet, highest grade lambs wool
Heavy-pile carpet compound rubbing pad
Three sanding discs—coarse, medium, fine grits
Full directions

Full money back guarantee. Sent postpaid anywhere in U. S.

DIRECT DRIVE
Polishing and Sanding Kit

ONLY $1.49 Postpaid

Designed for use with any electric drill. Kit contains: Rubber head with cup washer, screw and adaptor; highest grade genuine lambs wool polishing bonnet; medium grit sanding disc. Ideal for use with chuck and drill bench mountings and for ¼" electric drills. Operates at drill speed. Full money back guarantee. Sent postpaid anywhere in U. S.

PALM GRIP RATCHET SCREW DRIVER SET

ONLY $6.50 POST PAID

Handiest thing yet for loosening those hard-to-get wood and metal screws. Heavy-duty palm ratchet fits ¾" standard socket in driver heads. Also fits all ¾" standard wrench sockets. Heavy duty screw drivers have tool steel blades and tough, non-burning "Tenite" handles. 3 sizes fit every need. Practical, time saving. Designed for auto mechanics, machinists, electricians, carpenters, farmers, home craftsmen, building maintenance men, cabinet and furniture workers. Palm ratchet operates right and left with center lock. Full money back guarantee. Sent postpaid anywhere in U. S.

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LAKE SALES, INC.
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Enclosed find ( ) cash, ( ) check; ( ) money order for which please send me the kit checked below.

( ) Complete, 3 Speed Kit	$7.95
( ) Direct Drive Kit	1.49
( ) Ratchet Screw Driver Kit	6.50

Name: .....

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DEALERS—SEND FOR FULL INFORMATION

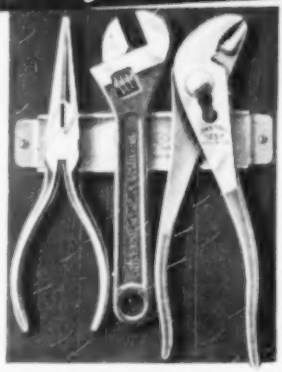
For Dad on *Father's Day*

UTICA MagneKit
with Magnetic Tool Holder

with these 3 tools you can

grip join
turn squeeze
hold straighten
twist fasten
push tighten
pull loosen
bend cut

anything in and around the house



MagneKit includes
6" Long Chain Nose Pliers
6" Adjustable Wrench
7" Angle Nose Pliers,
PLUS Magnetic Tool Holder,
all for price of tools, alone $5.85

Here's a gift Dad will prize! The 3 basic tools the hobbyist or handyman uses constantly in construction and repair work—PLUS a powerful, *permanent* Magnetic Holder. "Professional" tools, these, that enable anyone, novice or expert, to do the job easier, quicker, better. Your hardware store has the handy, new MagneKit or can get it for you.

Utica Drop Forge & Tool Corporation • Utica 4, N. Y.

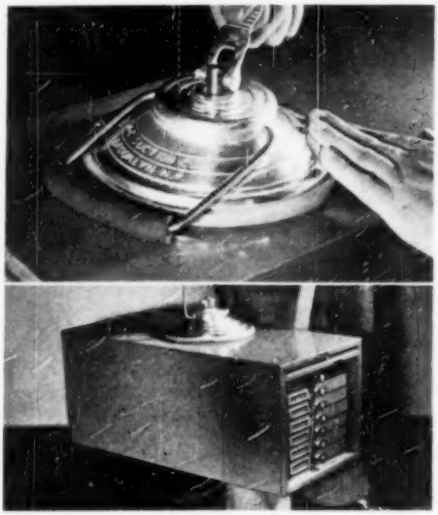
It pays to buy UTICA *quality tools*

PEEL PAINT TO BARE WOOD WITH ONE EASY STROKE

NEW ELECTRICAL TOOL removes 1 to 10 or more coats of paint from any wood surface as easy as cutting butter with a hot knife. No scraping, cutting, burning, sanding, or chemicals. The new Lectro Paint Peeler instantly softens paint electrically and peels it off the surface clean to the bare wood with one easy stroke. It's faster than a blow torch—there's no danger of fire—will not scorch or burn delicate wood surfaces. Makes no mess—no smell—it's even fun to use. Removes any paint, enamel quickly and easily. Sturdily constructed to last for years. Sent complete with extra long, quality electrical cord. Simply plug into any A.C. or D.C. outlet—let heat for several minutes and remove paint to the bare wood on exterior or interior painted surfaces, floors, woodwork, cupboards, furniture, antiques, boats, window sills, screens, doors—a hundred other uses. Price $4.95 postpaid—nothing else to buy. Full money back guarantee. For immediate shipment—send check, cash or money order to:

LECTRO WELD, INC.
3495 West 140th St. Dept. PS-6 Cleveland 11, Ohio

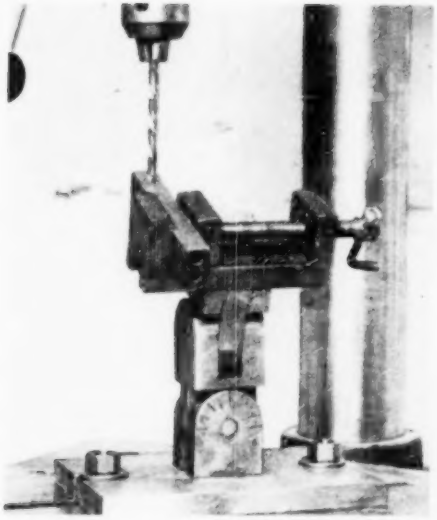
New Tools



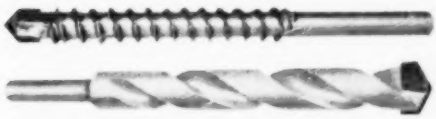
Giant Suction Cup. Heavy, bulky objects—if they have a smooth, flat surface—can be moved easily with this jumbo suction cup. Its manufacturer, the A-C Suction Cup, Brooklyn, N. Y., makes no specific claims as to the amount of weight the cup will handle, since surfaces vary greatly. However, it has proved successful in moving furniture and large sheets of plate glass.

To attach the cup, the control lever is pushed down. This brings up a metal disk in the center of the rubber disk, creating a strong suction that is sealed by the rubber around the edges.

Calking Gun Has Plier Grip. This gun is said by the maker—Western Reserve Manufacturing Co., Cleveland—to cut calking time as much as 30 percent. The gun is operated by a squeezing action of your hand—the same as you'd use with a pair of pliers. Either cartridge or bulk compounds can be used in the gun. Changeover from bulk to cartridges requires only the removal of two leather washers. Interchangeable nozzles for various jobs are available. The gun comes in three sizes: 15-, 30-, and 45-cu. in. capacity.



Compound Angle Vise. This vise, made by En Fab, Inc., of Kalamazoo, Mich., holds work at compound angles for grinding, milling, or drilling. The price is about $25. By removing four recessed-head screws, the swivel vise can be converted to a straight drill vise. The vise will hold work up to 1½" by 2½". Size of the slotted base is 4" by 6". Over-all height is 6". The unit swings 180° in either direction. Original setups may be made by the index marks, but for greater accuracy, a surface gauge is suggested.



Two New Masonry Drills. Both of these drills—made in standard sizes—speed up masonry drilling by carrying the dust out of the hole as they drill.

The drill in the upper photo is made by Carboloy Co., Inc., Detroit. High-tensile strength wire, swaged to the shank at upper and lower ends, is wound around the shank. Dust cut loose by the tip is lifted up and out of the hole by the wire spiral.

The other photo shows a drill made by Kennametal Inc., Latrobe, Pa. It has an angled cutting point of cemented carbide that the maker claims gives the drill greater biting power. The spiral cleans the dust out of the hole.

P.S. Last minute news & notes...

AUTO FIGURES: The U. S. now has 35,000,000 cars. Los Angeles County alone has more than the whole of Asia. Two out of every five cars now on the road are 10 or more years old. Since 1925, the average lifetime of a car has nearly doubled. Life expectancy of those now being made is 12 years. There've been 1,850 American makes of autos, but only 20 are still being produced. Last year 5,000,000 passenger cars were made in the U. S.--enough to fill 16 traffic lanes from Boston to Los Angeles.

CANCER DETECTION will be easier through a new technique devised by four scientists of the University of California at Los Angeles. More work must be done, however, before it is available for general use. The method is based on mixing a patient's blood plasma with a fatty substance extracted from the liver of a person who has died of cancer. If the plasma remains clear, the reaction is positive; if it becomes murky, the reaction is negative.

COLORADO SHEEPHERDERS' children never use the hundreds of rubber wading pools now being sold to Western ranchers. Instead of the heavy galvanized iron tanks once used for dipping and watering sheep, the new neoprene, portable, collapsible wading pools fill the bill exactly.

ENGINE PROGRESS: Combinations of metals and ceramics (called Metamics) are being tried to withstand the high temperatures in jet engines . . . Magnetic-fluid clutches in which cylinders are used in place of disks are being tested in General Electric's labs . . . Better self-starters for gas-turbine planes have been made possible by the development of a new auxiliary power system.

WHEN THINKING MACHINES of the future make a mistake, they'll know it and automatically correct it. A Bell Telephone Laboratories mathematician has figured out a way to build a conscience into computers that will give them this superhuman ability.

SAFETY SCHEMES: A traffic light that talks is being tried out in Syracuse, N. Y. It reminds pedestrians, 'Look right, look left; it may save your life.' . . . Coal mining is being made safer by bolting layers of rock together like plywood. This makes the mine roofing self-supporting . . . Shooting galleries can be made safer now, too--by using newly developed cartridges that pulverize rather than spatter.

ATOMIC NEWS: Construction of a nuclear reactor to yield power for peacetime purposes at West Milton, N. Y., has been postponed. Instead, GE scientists who've been planning that project have been directed by the AEC to concentrate on developing an atomic engine for ships--the second one now in the works . . . Another gigantic atom-smasher is scheduled to be built near San Francisco for secret work.

A RAPID-REVERSING MOTOR developed by the National Bureau of Standards can change direction of rotation 20 times while you're winking an eye. It has been easy to stop a motor quickly with a brake; the hitch was to rev it up to full speed quickly the other way. In NBS's invention, kinetic energy of the rotor, instead of being dissipated as heat in a brake, is used to twist a spring-steel rod that then flips the rotor rapidly in the opposite direction.

PLASTIC PADS are being produced now to go between railroad ties and the steel tie plates. Tests have shown that they prolong the life of the wooden ties . . . VACUUM TUBES put in the 'bulges' (amplifiers) of a telephone cable that is being laid between Florida and Cuba are expected to last 25 years.

The Editors

Dave Saves the Day

Puts
"NEW LIFE"
in his trusty Ford!

Your guarantee of the real thing

• All wearing parts and surfaces reconditioned or replaced with new Genuine Ford Parts • Guaranteed by Authorized Reconditioner against defects for 4,000 miles or 90 days • See your nearest Ford Dealer or Independent Garage.

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Marfak is extra tough and stretchy—specially co
to bearings and vital wear points. That's why
chassis—not for a few hundred miles but for 1,0
Enjoy that swell "cushiony" driving ease that *last*
never by chance. Get *Marfak* lubrication today at
the best friend your car ever had.

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OMPANY
LL 48 STATES
tributed in Canada

E on television every Tuesday night. See newspaper for time and station.

$15.20 an

Only Presto Has ALL These Features

- Ends Fire as Fast as 3 Seconds
- Chemical Contents 1.5 to 6 Times More Effective than Others on Equal Weight Basis
- Weighs Less Than 1 lb.
- Easily Held in One Hand—Even by a Child
- Needs No Inspection or Re-Charging—Does Not Corrode or Deteriorate
- Costs Only $3.98—Yet Out-Performs Bulky Extinguishers Costing Several Times As Much
- Automatic Pressure—No Pumping
- Guaranteed for 20 Years—Certificate Packed with Every Presto

This is the average earning r
WILLIAM F. WYDALLIS. "The
profits because of America's s
extinguishing discovery.

WOULDN'T YOU like to be making the kind of money William F. Wydallis is making? His story (printed at right) is just one example of the brilliant success that Presto salesmen are meeting everywhere!

A Florida salesman earned $600 in one month. An Ohio man earned $2100 in two months. A New York salesman earned $1500 in one month. A New Hampshire salesman added the Presto as a *sideline* and picked up an extra $1800 in 20 months.

WHAT IS THE

PRESTO contains an amazing new chemical — "Chlorobromomethane" or "C.B." The Germans developed "C.B." as a secret defense against fire during the war. After the war, a famous American firm, The Dow Chemical Company, acquired the formula from the U.S. Government and began manufacturing it here. Then we (Merlite Industries) designed a *handy—yet amazingly effective—fire extinguisher* to contain and release this new wonder chemical.

Dow's Findings on "C.B."

In comparing the effectiveness of "C.B." in fighting various kinds of fires The Dow Chemical Company's report states: "It has been proved that 'C.B.' is *about 1.5 to 6 times as effective as other common extinguishing agents on an equal weight basis.*"

This extra effectiveness of "C.B." means that Presto can be made light and handy enough for even a woman or child to use. No pumping—no heavy tank or tangled tubes to struggle with. Just a twist of the knob . . . . and flames disappear! Sells on sight to owners of homes, cars, stores, farms, service stations, boats, motorcycles, factories, offices.

Why Large Presto Profits Are So Easy

Everyone is terrified at the very *thought* of FIRE! *Every year* fire kills more than 11,000 people—and destroys over SEVEN HUNDRED MILLION

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g reported by Presto salesman "The sky's the limit" on Presto 's serious need for this new fire

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Help Save Your Town's Homes from FIRE! Fat in a frying pan bursts into flame . . . a short circuit . . . in a few minutes the entire house is threatened! PRESTO ends flames like these fast as 2 seconds. No wonder Presto representatives are welcome everywhere!

WILLIAM F. WYDALLIS

"Most specialty salesmen are always on the lookout for a 'natural.' The 'natural' of this decade is the PRESTO FIRE EXTINGUISHER . . . because it is handy in size, simple to operate, and in the right price range. Very seldom does a prospect say No to having this extinguisher in his car or home. A simple demonstration clinches all further resistance.

"For every hour I have devoted to the Presto, I find that I have earned an average of $15.20 an hour. I am now convinced that extraordinary money can be made in this safety field. I am devoting more of my time to this product now since I have discovered that the earnings on this item are greater than any item I have handled in the past."

—William F. Wydallis
Van Wert, Ohio

HE SECRET?

dollars worth of property in the U. S. The annual fire toll is more than DOUBLE what it was 10 years ago! Millions of people have been waiting for this sure, simple, inexpensive fire safeguard. So most people who see Presto in action immediately want to buy one or more—SPECIALLY WHEN THE PRICE IS ONLY $5.98 EACH!

You can demonstrate Presto in a few minutes, and every sale will net you $1 or more. We give you free re-fills for your Demonstrator . . . free (and dramatically powerful) printed sales material to "talk from" . . . free certificates testifying that Presto is GUARANTEED FOR 20 YEARS!

YOU DON'T NEED TO INVEST A PENNY. Just collect and *keep* $1 or more every time you write an order—we collect the balance and deliver the extinguisher. (Or if you *wish*, you can buy from us at extra-low wholesale prices and then make up to $2.18 profit per unit supplying both dealers and retail customers—we'll send you free details.)

Get Started Now—Mail Coupon

Get started in this rich new field now. Don't "put it off"! Every day you hesitate may cost you $10, $15, or even $50 you could otherwise be making. Mail the coupon NOW for everything you need to get started right away! **MERLITE INDUSTRIES, Inc., Dept. 116, 201 East 16th Street, New York 3, N. Y.**

JUST CUT OUT AND MAIL THIS CARD —NO STAMP OR ENVELOPE NEEDED

MERLITE INDUSTRIES, Inc., Dept. 116
201 East 16th Street, New York 3, N. Y.

Please send me illustrated sales literature, liberal profit plan, order blanks—everything I need to get started making good money introducing the Presto Fire Extinguisher in my locality.

☐ **CHECK HERE IF YOU WISH TO ORDER DEMONSTRATION SAMPLE AT COST ($2.50).** Pays for itself many times over in increased sales. Can be returned as often as you like for FREE re-fill. You needn't send any money now—just cut out and mail this postage-free card, and we'll send Demonstrator C.O.D. (Or if you wish to save C.O.D. and postage charges, mail $2.50 in an envelope with this card and WE'LL pay postage.)

Name _____

Address _____

City _____ *Zone No. (if any)*

State _____

"LIGHTNING PROFITS"

INTRODUCING SCIENCE'S NEW MIDGET MIRACLE

READ INSIDE HOW YOU CAN GET STARTED ON THE WAY TO MAKING THIS KIND OF MONEY:

$20 A DAY!

H. J. KERR

"Am selling a greater service at lower price than has ever been possible. I easily make $20, at least, every day I work."

$1000 A MONTH!

CHARLES KAMA

"I think I've succeeded pretty well. I'm making more than a thousand dollars a month and haven't touched bottom yet."

$75.56 ON FIRST DAY!

R. E. MEADE

"I made a net profit of $75.56 the first day! Who said it couldn't be done? If you had such a man send him to me."

$10 PER HOUR!

HUGH SADLER

"Initially put in 5½ hours. My sales amounted to $95.52. My sales therefore amount to more than $10 per hour at a profit of over $10 per hour!"

JUST CUT OUT AND MAIL THIS CARD

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NO STAMP NEEDED

BUSINESS REPLY CARD

No Postage Stamp Necessary if Mailed in the United States

4c POSTAGE WILL BE PAID BY

MERLITE INDUSTRIES, INC.

201 EAST 16TH STREET

Dept. 116 NEW YORK 3, N. Y.

FIRST CLASS PERMIT No. 52914 (Sec. 34.9 P.L.&R.) New York, N. Y.

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"ON MY JOB, MY THROAT GETS A WORKOUT. THAT'S WHY I MADE MY OWN 30-DAY TEST AND CHANGED TO CAMELS FOR KEEPS!"

TELEPHONE OPERATO

RADIO
GEORG

Start

NOTED THROAT SPECIALISTS REPORT ON 30-DAY TEST OF CAMEL SMOKERS . . .

ot one single case of throat tation *due to smoking* CAMELS!

hese were the findings of noted throat specialists
total of 2,470 weekly examinations of the throats
ndreds of men and women who smoked Camels
– and only Camels – for 30 consecutive days.

"As a singer, naturally I smoke the cigarette that agrees with my throat...CAMEL!"

Lanny Ross

The golden tenor voice that has entertained millions explains: "The 30-day test showed me how much fun smoking can be! Camels suit my throat, and they're a great-tasting smoke."

R. J. Reynolds Tobacco Company, Winston-Salem, N. C.

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PERATOR MRS. ETHEL JAMES

"THROAT IRRITATION DOESN'T GO IN MY JOB...I SMOKE ONLY CAMELS. THEY'RE RIGHT FOR MY THROAT... THEY'RE COOL AND MILD!"

RADIO ANNOUNCER GEORGE ANSBRO

COSMETIC DEMONSTRATOR MADELINE OSTROWE

"I TALK TO THOUSANDS OF SHOPPERS. WHEN I SMOKE, I HAVE TO THINK OF MY THROAT. THAT'S WHY CAMEL IS MY CIGARETTE. CAMELS ARE SO MILD!"

MUSEUM GUIDE WALTER McGRATH

"30-DAY MILDNESS TEST? I'VE SMOKED CAMELS FOR 17 YEARS AND I KNOW THEY AGREE WITH MY THROAT! THEY'RE A GREAT-TASTING CIGARETTE, TOO!"

● You have the word of Camel smokers . . . of noted throat specialists . . . but test Camels for yourself in your "T-Zone (T for Taste and T for Throat). See if you don't agree that Camels are the mildest, best-tasting cigarette you ever smoked!

rt your own 30-Day Camel MILDNESS Test Today!